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ევროპის უნივერსიტეტის საერთაშორისო
სამეცნიერო გამოცემა

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ევროპის უნივერსიტეტის საერთაშორისო
სამეცნიერო-პრაქტიკული ჟურნალი

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სარედაქციო კოლეგიის წევრები:

მთავარი რედაქტორი – **გოჩა თუთბერიძე** – ეკონომიკის დოქტორი, აფილირებული პროფესორი, ევროპის უნივერსიტეტი. რექტორი, პროფესორი, ევროპის ცენტრალური უნივერსიტეტი. განათლების ხარისხის განვითარების ეროვნული ცენტრის აკრედიტაციის ექსპერტი. (საქართველო)

ილია ბოცვაძე ბიზნესის ადმინისტრირების დოქტორი, შავი ზღვის საერთაშორისო უნივერსიტეტი, ასოცირებული პროფესორი, ევროპის უნივერსიტეტის ბიზნესისა და ტექნოლოგიების ფაკულტეტის დეკანი. (საქართველო)

ნუგზარ თოდუა ეკონომიკის მეცნიერებათა დოქტორი, ივანე ჯავახიშვილის სახელობის თბილისის სახელმწიფო უნივერსიტეტის პროფესორი. (საქართველო)

ეკატერინე ლომია პოლიტიკის მეცნიერების დოქტორი. ივანე ჯავახიშვილის სახელობის თბილისის სახელმწიფო უნივერსიტეტის კვლევით ცენტრში „საქართველოს სამეზობლოს კვლევის ინსტიტუტი“ მკვლევარი. ა(ა)იპ საქართველოს მეცნიერთა საბჭოს წევრი. (საქართველო)

ქუჯი ბიჭია (ევროპის ეკონომიკის დოქტორი, ევროპის უნივერსიტეტის ასოცირებული აფილირებული პროფესორი. (საქართველო)

ეკატერინე ნაცვლიშვილი ფილოსოფიის დოქტორი, ევროპის უნივერსიტეტის აფილირებული პროფესორი, ბიზნესის ადმინისტრირების საბაკალავრო პროგრამის ხელმძღვანელი, განათლების ხარისხის განვითარების ეროვნული ცენტრის აკრედიტაციის ექსპერტი. (საქართველო)

გოჩა თოდუა ფიზიკა-მათემატიკურ მეცნიერებათა დოქტორი, პროფესორი, ევროპის უნივერსიტეტი. (საქართველო)

თორნიკე ხოშტარია ბიზნეს ადმინისტრირების დოქტორი, ევროპის უნივერსიტეტის პროფესორი, სასწავლო უნივერსიტეტი გეომედის ჯანდაცვის ეკონომიკისა და მენეჯმენტის ფაკულტეტის დეკანი. (საქართველო)

ლია ჩარექიშვილი ეკონომიკურ მეცნიერებათა აკადემიური დოქტორი, ევროპის უნივერსიტეტი. (საქართველო)

არჩილ ჩოჩია სამართლის დოქტორი, ტალინის ტექნოლოგიური უნივერსიტეტი. (ესტონეთი)

ლიუდმილა ალექსეიევა ასისტენტ-პროფესორი, ეკონომიკის დეპარტამენტი, დაუგავპილსის უნივერსიტეტი. (ლატვიის რესპუბლიკა)

მოშე ბარაკი ემერიტუსი პროფესორი, მეცნიერებისა და ტექნოლოგიების განათლება, ნეგევის ბენგურიონის უნივერსიტეტი. (ისრაელი)

ოლიონა ბაჟენოვა ეკონომიკის დოქტორი, ეკონომიკური კიბერნეტიკის დეპარტამენტი, ტარას შევჩენკოს სახელობის კიევის სახელმწიფო უნივერსიტეტი. (უკრაინა)

ვისემ აჯილი ბენ იუსეფი დოქტორი, ასოცირებული პროფესორი, ESLSCA პარიზის ბიზნეს სკოლა. (საფრანგეთი)

ენკარნ ალვარეს ვერდეხო დოქტორი, კვანტიტატიური მეთოდები ეკონომიკაში და ბიზნესში, გრანადას უნივერსიტეტი. (ესპანეთი)

პატრიცია გაზზოლა ასოცირებული პროფესორი, ინსუბრიის უნივერსიტეტი. (იტალია)

ფიტიმ დიარი ასოცირებული პროფესორი, ბიზნესისა და ეკონომიკის ფაკულტეტი, სამხრეთ-აღმოსავლეთ ევროპის უნივერსიტეტი. (ჩრდილოეთ მაკედონიის რესპუბლიკა)

რიმა ტამოსიუნიენე პროფესორი, ფინანსური ინჟინერიის დეპარტამენტი, ვილნიუსის გედიმინასის სახელობის ტექნიკური უნივერსიტეტი. (ლიეტუვის რესპუბლიკა)

მანუელა ტვარონოვიჩენი პროფესორი, ბიზნეს ეკონომიკისა და მენეჯმენტის დეპარტამენტი, ვილნიუსის გედიმინასის სახელობის ტექნიკური უნივერსიტეტი. (ლიეტუვის რესპუბლიკა)

რეჯინა დემიანიუკი ასისტენტ პროფესორი, სოციალურ მეცნიერებათა ფაკულტეტი, შიდელცეს უნივერსიტეტი. (პოლონეთი)

ჯოზეფა გარსია მასტანზა პროფესორი, ეკონომიკისა და ბიზნესის ადმინისტრირების დეპარტამენტი. (მალაგას უნივერსიტეტი, ესპანეთი).

იზეთ ზექირი პროფესორი, ბიზნესისა და ეკონომიკის ფაკულტეტი, სამხრეთ-აღმოსავლეთ ევროპის უნივერსიტეტი. (ჩრდილოეთ მაკედონიის რესპუბლიკა)

განნა ჟოსანი ეკონომიკის დოქტორი, ხერსონის სახელმწიფო აგრარული უნივერსიტეტი. (უკრაინა)

ძინტრა ილისკო დოქტორი, პროფესორი, დაუგავპილსის უნივერსიტეტი. (ლატვია)

მოჰამედ შაფიუდინი დოქტორი, ასისტენტ-პროფესორი, მენეჯმენტისა და ტექნოლოგიის კოლეჯი (ომანი), მკვლევარი, ამერიკის საფინანსო ასოციაციის წევრი მენეჯმენტისა და კომერციის საერთაშორისო კვლევითი ჟურნალის სარედაქციო კოლეგიის წევრი. (ომანი)

ლიუდმილა დემიდენკო ასოცირებული პროფესორი, ტარას შევჩენკოს სახელობის კიევის სახელმწიფო უნივერსიტეტი. (უკრაინა)

ვლადიმერ მენშიკოვი პროფესორი, დაუგავპილსის უნივერსიტეტი. (ლატვიის რესპუბლიკა)

ნაზიმ მუსაფარლი იმანოვი დირექტორი, ეკონომიკის ინსტიტუტი, აზერბაიჯანის მეცნიერებათა ეროვნული აკადემია. (აზერბაიჯანი)

როსიცა იალამოვა ასოცირებული პროფესორი, ლეტბრიჯის უნივერსიტეტი. (კანადა)

ოლგა ლავრინენკო ეკონომიკის დოქტორი, მკვლევარი, დაუგავპილსის უნივერსიტეტი. (ლატვიის რესპუბლიკა)

გორდონ ლ. ბრედი ლექტორი, ჩრდილოეთ კაროლინის უნივერსიტეტი, გრინსბორო. (აშშ)

ელიტა ერმოლაევა პროფესორი, ეკონომიკისა და სოციალური განვითარების ფაკულტეტი, ლატვიის სასოფლო-სამეურნეო და ტექნოლოგიების უნივერსიტეტი. (ლატვია)

სირჯე ვირკუსი დოქტორი, ციფრული ტექნოლოგიების სკოლა, ტალინის უნივერსიტეტი. (ესტონეთის რესპუბლიკა)

ინტა ოსტროვსკა პედაგოგიურ მეცნიერებათა დოქტორი, დოცენტი, დაუგავპულსის უნივერსიტეტი. (ლატვიის რესპუბლიკა)

ლინა პილელინე ბიზნეს ადმინისტრირების დოქტორი, პროფესორი, ვიტაუტას მაგნუს უნივერსიტეტი. (ლიეტუვას რესპუბლიკა)

მჰერ საჰაკიანი საერთაშორისო ურთიერთობების დოქტორი, ჩინეთის ნანჯინგის უნივერსიტეტი, ლექტორი, მეცნიერებათა ეროვნული აკადემია. დამფუძნებელი და დირექტორი, ჩინეთ-ევრაზიის პოლიტიკური და სტრატეგიული კვლევების საბჭო. (სომხეთი)

ალექსანდრ სტრატანი ეკონომიკის დოქტორი, პროფესორი, ეკონომიკური კვლევების აკადემია. (მოლდოვა)

ემანუელ მორუჩი სოციოლოგიის დოქტორი, ბრესტის დასავლეთის კათოლიკური უნივერსიტეტი, ბრესტი, ბრეტანი. ევროკომისიის «ევროპის გუნდი საფრანგეთი»-ის წევრი. CECI - ევროპის მოქალაქეობისა და იდენტობების წრის პრეზიდენტი. საფრანგეთი

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ARTICLE

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RESCUING STRUGGLING COMPANIES THROUGH PREVENTIVE CORPORATE RESCUE TOOLS: ECONOMIC IMPLICATIONS OF THE FRENCH AND MOROCCAN SPECIAL MANDATE MODELS

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Abstract. This paper presents a comparative analysis of the "Special Mandate" as a preventive mechanism for rescuing struggling companies, focusing on French and Moroccan legislation. While existing studies focus on legal doctrine, this paper addresses a critical gap by linking these legal frameworks to their tangible economic outcomes, which is essential for evaluating their true effectiveness in the marketplace.

The analysis contrasts two divergent legislative philosophies. The French model is notably broad, applying to nearly all types of enterprises regardless of their legal form, reflecting a proactive stance on economic intervention. It provides detailed procedural rules governing the agent's (mandataire ad hoc) appointment, potential conflicts of interest, and the precise scope of the mission.

Conversely, the Moroccan approach is significantly more restrictive, limiting the procedure mainly to commercial "traders" (commerçants) and containing legislative gaps that create procedural uncertainty for both debtors and creditors. While the procedure's key advantages in both systems are its confidentiality and simplicity, its purely contractual nature presents a major limitation, as its success is entirely contingent upon voluntary creditor participation, which is often difficult to secure in distressed situations.

The paper concludes that the French model's enhanced legal flexibility correlates with superior economic performance, evidenced by outcomes such as a 2.6-fold higher debt recovery rate, offering a clear, data-driven recommendation for legislative reform based on proven economic stability.

KEYWORDS: MODERN BANKRUPTCY LAWS, PREVENTIVE PROCEDURES, SPECIAL MANDATE, STRUGGLING COMPANIES, COMPANY RESCUE, ECONOMIC OUTCOMES, INVESTMENT CLIMATE.

INTRODUCTION

In their efforts to improve the investment climate, nations strive to enhance the legal system that governs the economic sphere. For a long time, this system followed a singular path: simplifying and facilitating the establishment of companies to foster a strong economic fabric. However, fierce competition among these companies, on the one hand, and economic crises on the other, have expedited the need for nations to focus on an alternative path: ensuring the continuity of these companies by supporting and rescuing them. The cessation of these companies' activities has negative consequences that extend beyond the economic sphere, such as the potential for other companies to default on their payments due to the non-payment of their debts, and a reduction in tax revenues for the public treasury, to the social sphere, namely, the layoff of workers.

The economic and social stakes are substantial. In 2024 alone, France registered a record 67,830 company failures, threatening 256,000 jobs. Similarly, Morocco saw over 15,658 firms enter insolvency proceedings in the same period, with the commerce and real estate sectors being most affected. These figures underscore the urgent need for effective rescue mechanisms.

This focus is embodied in the shift from old bankruptcy laws, which failed to achieve their objectives of protecting creditors and ensuring debt repayment, and which could only be realized by punishing the debtor company for what was considered an offense requiring a penalty, to modern bankruptcy laws. to modern bankruptcy laws. In some legislations, these are referred to as company rescue laws, the primary goal of which is to preserve the economic and social fabric by maintaining the company's continuity and, consequently, safeguarding employment. The recovery of debts by creditors thus becomes a natural outcome of the company's survival.

This legislative shift is not isolated; it is part of a distinct global trend. Nations are strategically reforming their laws in what has been termed "regulatory competition"[1] to attract international capital. This trend is echoed in the latest macroeconomic analyses. The International Monetary Fund (IMF, 2024),[2] in its recent Article IV consultation for France, emphasizes the resilience of the French economy, supported by a robust framework for corporate restructuring, which is crucial for post-pandemic recovery.

Similarly, the European Commission (2024),[3] in its in-depth review, links future economic performance to the efficient handling of corporate distress. This movement, once promoted by UNCITRAL, has now been codified at a regional level. The most significant recent development is the EU Directive 2019/1023 on Preventive Restructuring, which mandates all member states to adopt effective pre-insolvency frameworks, validating the very philosophy underpinning the French model.[4] Comparative studies on the transposition of this directive note that the established French model served as a key inspiration for the Directive's emphasis on flexible, pre-judicial mechanisms.[5]

In this context, the importance of preventive measures in modern bankruptcy legislation has emerged as proactive tools aimed at saving viable enterprises rather than liquidating them. The "Special Mandate" is one of the most prominent of these measures, a confidential, preventive mechanism that originated in French judicial practice before being formally adopted by French and subsequently Moroccan legislators.

Therefore, this study, employing a comparative analytical methodology reinforced by economic data analysis, seeks to examine the nature of this procedure in French and Moroccan legislation. The objective is to distill insights that could aid in adopting an effective system for proactively

1 Schmidt, J. (2023). Preventive restructuring frameworks: Jurisdiction, recognition and applicable law. International Insolvency Review, 32(3), pp. 427-447. <doi.org/10.1002/iir.1518>.

2 International Monetary Fund (IMF). (2024). France: 2024 Article IV Consultation – Staff Report. IMF Country Report No. 2024/219. Washington, D.C.

3 European Commission. (2024). Commission Staff Working Document: In-Depth Review 2024 – France.

4 Gerasimova, T. G., Galkina, A. S., Kartaeva, K. L., Kholopova, V. V. (2024). Corporate insolvency laws in selected jurisdictions: US, England, France, and Germany – A comparative perspective. Journal of Risk and Financial Management, 17(3), p. 120. <doi.org/10.3390/jrfm17030120>.

5 Lancaster University (Lancaster EPrints). (2025). The transposition of the Preventive Restructuring Directive (2019/1023) in France and Germany.

addressing company difficulties by demonstrating how specific legislative choices in the Special Mandate procedure correlate with divergent economic outcomes.

This is particularly relevant given that the World Bank introduced a tenth indicator related to resolving insolvency in its 2017 Doing Business annual report – a report often relied upon by foreign investors in selecting a suitable investment environment.

This indicator reveals stark differences: France ranks 26th globally for resolving insolvency, while Morocco ranks 73rd. The economic implications of this gap are profound. France's framework facilitates an average debt recovery rate of 74.8 cents on the dollar, compared to just 28.7 cents in Morocco. This study argues that these economic disparities are not accidental but are a direct consequence of the differing legal philosophies and mechanisms, such as the Special Mandate, adopted by each nation.

The study will address this through the following sections:

Part I: The Rules and Procedures for Appointing a Special Agent.

Section 1: Eligibility Criteria for the Special Mandate Procedure.

I – Personal Scope of Application for the Special Mandate Procedure (Condition of Legally Defined Status).

II – Material Scope of Application for the Special Mandate Procedure (The Company's Situation).

Section 2: Rules About the Appointment of the Special Agent.

I – Procedures for Appointing the Special Agent and the Limits of the Court President's Authority.

II – Conflicts of Interest About the Special Agent.

Part II: The Legal Framework for the Special Agent's Mission.

Section 1: The General Framework of the Special Agent's Mission.

I – The Limits of the Special Agent's Mission.

II – Determination of the Special Agent's Remuneration.

Section 2: Advantages of the Special Mandate Procedure.

I – Confidentiality.

II – Flexibility and Simplicity.

METHODOLOGY

This research adopts a mixed-method approach, combining a comparative legal-doctrinal analysis with a quantitative assessment of economic outcomes. The primary methodology involves a doctrinal comparison of the French Commercial Code (Book VI) and the Moroccan Commercial Code (Law No. 73-17) concerning the Special Mandate. This legal analysis focuses on the scope, appointment procedures, and operational rules of the mechanism. **To address the research gap, this legal analysis is supplemented by economic data from international and national bodies. The study utilizes:**

1. **World Bank Data:** Comparative statistics from the Doing Business 2020 report on the "Resolving Insolvency" indicator (e.g., recovery rates, time, cost) are used to quantify the efficiency of each legal system. (See Table 1 and Figures 1-3);
2. **Current Macroeconomic Reports:** To supplement the 2020 World Bank data, this study incorporates recent (2024-2025) economic analysis and forecasts from the International Monetary Fund (IMF, 2024) and the European Commission (2024) to provide a current macroeconomic context;
3. **National Statistics:** Data on firm failures and employment impact from sources like Altares (as cited in BPCE L'Observatoire, 2024)[6] and Inforisk (as cited in Le360.ma, 2025)[7] are used to establish the scale of the economic problem;
4. **Recent Peer-Reviewed & Legal Sources:** To address the latest legal-doctrinal evolution, the analysis integrates recent (2021-2025) peer-reviewed articles and expert legal analysis (e.g., Gerasimova et al., 2024; Lancaster EPrints, 2025) focusing on the transposition of EU Directive 2019/1023 via

6 BPCE L'Observatoire. (2024, October). Business failures in Q3, 2024.

7 Le360.ma. (2025, June 16). Entreprises: un nombre record de faillites au Maroc en 2024 [Enterprises: a record number of bankruptcies in Morocco in 2024].

France's Ordinance No. 2021-1193, and its specific impact on preventive mechanisms (Sorbonne, 2024);

5. **Procedural Data:** Statistics on the usage frequency of preventive measures in France (e.g., Mandat ad hoc) from the CNAJMJ are used to demonstrate the mechanism's practical relevance. (see Table 2 and Figure 4).

The objective is to move beyond a purely descriptive legal comparison and demonstrate the correlation between legislative design and measurable economic performance.

PART I: RULES FOR AND PROCEDURES OF THE APPOINTMENT OF A SPECIAL AGENT

The special mandate was initially an experimental procedure that arose from the practice of French commercial courts, more specifically the Commercial Court of Paris, in 1990, during the real estate crisis, even in the absence of regulations governing it. However, some provisions related to it were later organized in Book VI of the French Commercial Code concerning business difficulties, under Article 04 of Law No. 94-475 of June 10, 1994, on the prevention and handling of business difficulties.[8] This was then supplemented by other provisions in Law No. 2005-845 of July 26, 2005, on the safeguarding of businesses.[9]

More significantly, this framework was substantially amended by the Ordinance of September 2021, which transposed the EU Directive 2019/1023 on Preventive Restructuring. This latest reform did not alter the core of the 'Special Mandate' (Mandat ad hoc) as a confidential and informal procedure. Instead, as legal analysis of the ordinance confirms (Sorbonne, 2024),[10] it reinforced its position. The reform intentionally preserved the Mandat ad hoc due to its proven effectiveness, solidifying its role within an integrated ecosystem that encourages early intervention.[11]

Moroccan legislation, which most closely follows French law among Arab legislations, established the possibility of appointing a special agent in the Law No. 15-95, which contains the Commercial Code.[12] It was then reaffirmed in the new effective Law No. 73-17 concerning difficulties of the undertaking,[13] given the importance of this procedure in addressing the difficulties faced by businesses.

French commercial law, and subsequently the Moroccan Commercial Code, legitimized the special mandate procedure after observing the positive results it had achieved since it was a judicial practice without legal basis.* This was an attempt to instill a culture of pre-emption, which requires time and trust to establish. The head of an enterprise who, years ago, would flee the court upon cessation of payments is now invited to knock on the judiciary's door at the first sign of difficulties.[14]

From a legislative drafting perspective, neither the French nor Moroccan legislators provided a specific definition for the special mandate. Instead, they defined the limits of eligibility for the special mandate procedure (Section One) and the rules concerning the appointment of the special

8 Law No. 94-475 of June 10, 1994, on the prevention and treatment of business difficulties. (1994, June 11). JORF No. 134.

9 Law No. 2005-845 of July 26, 2005, on the safeguarding of businesses. (2005, July 27). JORF No. 173.

10 Université Paris 1 Panthéon-Sorbonne (IEJ). (2024). Introduction to French Bankruptcy Law (Analysis of Ordinance 2021-1193).

11 Latham & Watkins. (2021, September 20). France Publishes Restructuring and Insolvency Law Reform Ordinance; Legal 500. (2024). France: Restructuring & Insolvency – Country Comparative Guides.

12 Law No. 15.95 on the Commercial Code, promulgated by Dahir No. 1-96-83 of August 1, 1996. (1996, October 3). Official Gazette of the Kingdom of Morocco, No. 4418.

13 Law No. 73.17 repealing and replacing Book V of Law No. 15.95 on the Commercial Code, regarding business difficulty procedures, promulgated by Dahir No. 1.18.26 of April 19, 2018. (2018, April 23). Official Gazette of the Kingdom of Morocco, No. 6667.

* For example, the number of times a special agent was appointed between 2006 and 2012 in France in commercial courts reached nearly 5,900 appointments. The acceptance rate of requests for the appointment of a special agent by the presidents of commercial courts alone in the same period reached 84.2%. For more statistics on the special mandate during the period 2006-2012, see Guillonneau, M., Haehl, J.-P., Munoz-Perez, B. (2013). The prevention of business difficulties through ad hoc mandate and conciliation before commercial courts from 2006 to 2011. Ministry of Justice.

14 Schwartz, M. G. (2013). The concept of the ad hoc mandate. Doctoral thesis, University of Poitiers, p. 193.

agent (Section Two). However, a comprehensive system for appointing the special agent is absent in the Moroccan Commercial Code, unlike in the French Commercial Code.

Section One: Eligibility Criteria for the Special Mandate Procedure

The Moroccan Commercial Code, following the model of the French Commercial Code, has defined the scope of application for the special mandate procedure. This scope is governed by two criteria that reflect the opinion of the legislators in both countries. The first criterion defines which persons can benefit from the special mandate procedure. In contrast, the second concerns the state of the enterprise that the legislation presumes the procedure can rectify.

I – Personal Scope of Application for the Special Mandate Procedure (Condition of Legally Defined Status)

The individuals who can benefit from the special mandate procedure are not different from those subject to prevention procedures, at least in French law. The latter has freed itself from classification and selectivity, considering that all persons influencing the economic landscape are concerned with internal and external prevention procedures alike.[15] This inclusive approach aligns with a broader European perspective favoring corporate innovation and diverse legal forms. This is detailed in Articles L611-2 and L611-2-1 of the French Commercial Code regarding the system of prevention procedures. The first article established the possibility for the President of the Commercial Court to summon the heads of commercial companies, economic interest groupings, and even individual commercial or craft enterprises to rectify the situation when it appears that the enterprise is suffering from difficulties that may threaten the continuity of its operations. The second article established the possibility for the President of the Judicial Court to summon the heads of private law legal entities and natural persons engaged in agricultural or independent professional activities, including liberal professions, for the same purpose of rectifying the enterprise's situation whenever possible. This was summarized in Article L611-3 of the same law, which provides for the possibility for the President of the Commercial Court or the President of the Judicial Court,* As the case may be, to appoint a special agent upon the request of the debtor enterprise, which can be commercial, craft, or any other activity, considering that all enterprises, regardless of their nature, constitute the economic fabric of the state and thus require protection.

In contrast, Moroccan law has adopted a more restrictive legislative choice regarding the persons who can benefit from the special mandate procedure and the procedures included in the law on business difficulties in general.

This choice is evident in the special mandate procedure in Article 550 of the Moroccan Commercial Code. It makes the "undertaking" (maqawala), as defined in Article 546, the subject eligible for the special mandate procedure. The latter article presumes that the undertaking, in its individual or collective form, is a "trader" (tajir). This, in turn, means the exclusion of individual or collective undertakings of a civil nature, such as associations, cooperatives, economic interest groupings with a civil purpose, liberal professions, and others.

This restrictive legal-doctrinal choice has tangible economic consequences. By limiting preventive measures to 'traders', Moroccan law excludes a significant portion of the economy, which correlates with weaker performance in resolving insolvency. This is compounded by recent analyses showing the specific vulnerabilities of Moroccan firms to post-pandemic economic shocks,[16] often stemming from internal and external factors that preventive laws could address.[17] The World

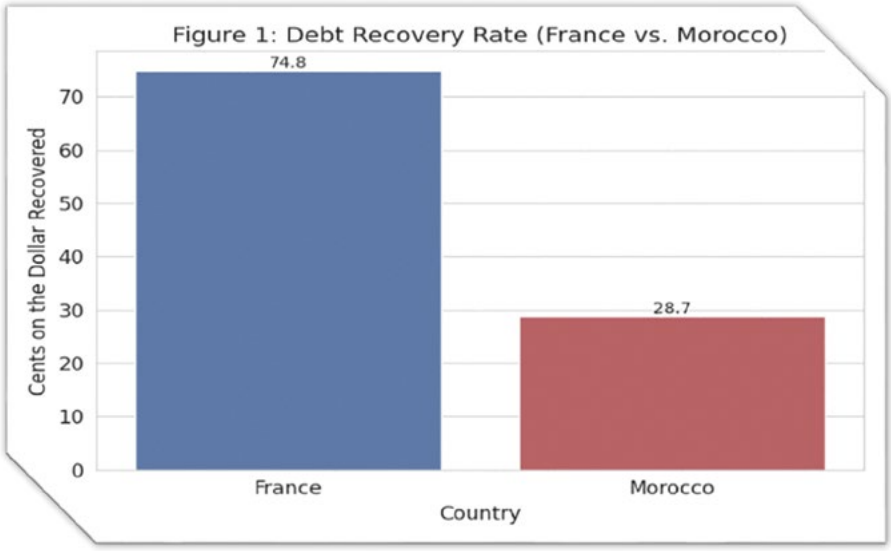
15 Möslein, F. (2021). Corporate asset locks: A comparative and European perspective. French Journal of Legal Policy.

* In French law, the High Court (tribunal de grande instance) has been replaced by the Judicial Court (tribunal judiciaire) through the law on programming and justice reform, pursuant to Ordinance No. 2019-964 of September 18, 2019, taken in application of Law No. 2019-222 of March 23, 2019, for the 2018-2022 programming and justice reform. (2019, September 19). JORF No. 0218.

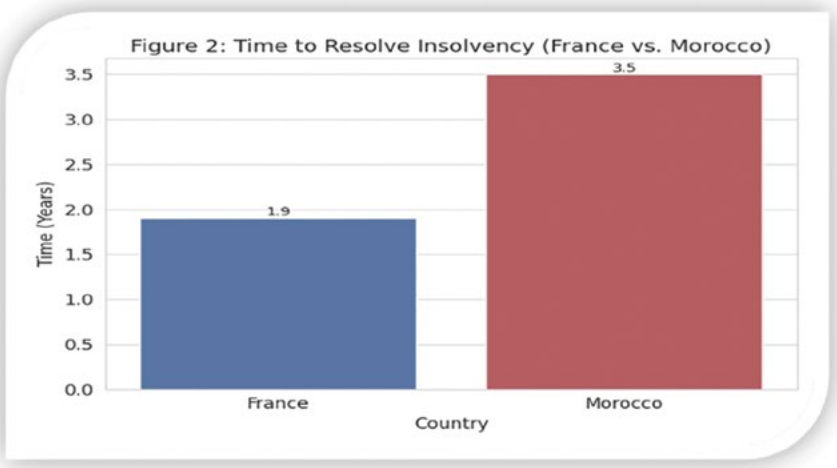
16 El Kettani, S., Bakkali, I. (2025). The impact of COVID-19 pandemic on Moroccan firms' performance: A pre – and post-crisis comparative analysis. Learning Gate, 5(1).

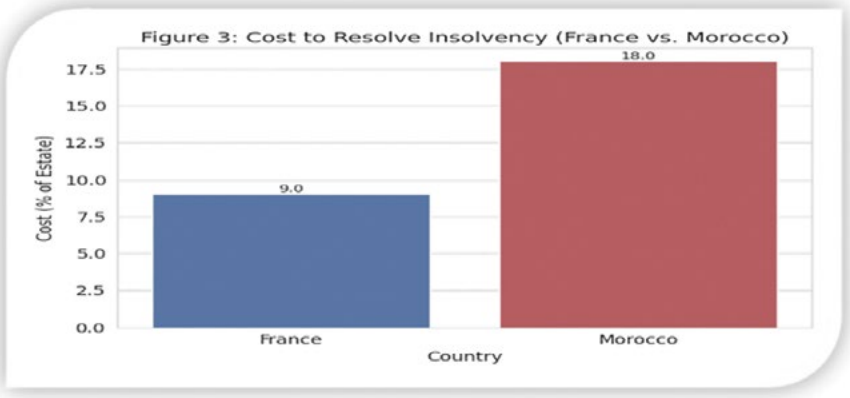
17 Ech-Chafi, I., Ait Ali, E. H. (2024). Causes et

Table 1. *Comparison of the "Resolving Insolvency" Indicator (World Bank 2020)*



ECONOMIC INDICATOR	FRANCE	MOROCCO	GAP (IN FAVOR OF FRANCE)
Recovery Rate (for creditors)	74.8 cents per dollar	28.7 cents per dollar	2.6times higher
Time required (for resolution)	1.9 years	3.5 years	1.8 times faster
Cost (% of estate)	9.0%	18.0%	Half the cost
Likely Outcome	Going Concern	Piecemeal Sale	-





Bank's 2020 data shows that Morocco's framework results in a protracted 3.5-year resolution process with a low 28.7% recovery rate. In contrast, France's broad personal scope is part of a legal philosophy that achieves a 74.8% recovery rate in just 1.9 years, making its economy more resilient and attractive to investors. (See Table 1))

Therefore, the Algerian legislator, and other legislations that may adopt the special mandate procedure, should establish a personal scope that includes all enterprises contributing to development, away from unjustified selectivity based on commercial status. However, it may be advisable to initially limit the personal scope to the most significant enterprises and then expand it later, considering the necessary resources in the form of specialized agents and judges.

Finally, fulfilling a person's legally defined status is not sufficient to initiate the special mandate procedure. Both French and Moroccan legislation require another condition related to the enterprise's situation.

II – Material Scope of Application for the Special Mandate Procedure (The Company's Situation)

Two questions have long been raised during debates on proposed laws concerning business difficulties in France: When is it appropriate to start dealing with the difficulties faced by enterprises? Moreover, how should they be characterized?[18] This means that different answers to these two questions, and consequently the different foundations associated with them, reflect the different approaches of bankruptcy legislation in determining the required state of the enterprise to open one procedure over another.

By examining the legislation under study, it can be said that they impose a condition related to the debtor enterprise's situation for it to request the opening of the special mandate procedure. The scope of this situation is generally linked to a minimum threshold, which is the existence of difficulties that could threaten the continuity of the enterprise's operations, and a maximum threshold, which is that the enterprise is not in a hopeless state, or what is usually expressed in different bankruptcy legislations as not having ceased payments for more than a specific period. Therefore, we will highlight the approaches adopted by the bankruptcy legislations under study on this issue regarding the special mandate procedure.

The general nature of the text of Article L611-3 of the French Commercial Code concerning the appointment of a special agent has made it a subject of many interpretations. Some have argued[19] that the request for the appointment of a special agent does not require any conditions related to the debtor enterprise's situation. This means that the competent authority to which the request is submitted cannot refuse the appointment of a special representative because the debtor enterprise is in a state of cessation of payments unless the period of cessation of payments exceeds 45 days.* This view is supported by the possibility of reversing the cessation of payments during the special mandate procedure by agreeing with creditors to postpone the due dates of their debts within a short period from the procedure's opening, especially in light of the French Court of Cassation's interpretation of this delay.[20]

Others argue[21] that the debtor enterprise must not be in a state of cessation of payments when submitting its request for the appointment of a special agent, based on the plain reading of Article L611-3 of the French Commercial Code, which does not permit it. The special mandate procedure was designed as a preventive, not a curative, tool. This view is supported by the fact that the acceptance of appointing a special agent for an enterprise in a state of cessation of payments is not a certainty in judicial practice.

However, while the text of Article L611-3 of the French Commercial Code does not explicitly

conséquences de la défaillance des entreprises marocaines: Un état de l'art. African Scientific Journal, 3(27).

18 Depoix-Robain, N. (1997). The amicable settlement of business difficulties. Doctoral thesis, University Paris IX Dauphine. p. 61.

19 Toh, A. (2015). The prevention of business difficulties: A comparative study of French law and OHADA law. Doctoral thesis, University of Bordeaux, p. 178.

* Because after this period, the competent judicial body will have no other option but to initiate judicial settlement or liquidation proceedings, as the case may be.

20 Valdman, D. (2008, January 23–24). Safeguard law: which procedure for which business difficulties? Strategic choices. Gazette du Palais, 1, 14.

21 Coquelet, M.-L. (2017). Businesses in difficulty, payment and credit instruments (6th ed.). Dalloz, p. 189.

permit the appointment of a special agent for an enterprise in a state of cessation of payments, it does not exclude it either. Furthermore, the conciliation procedure* that the French legislator also designed it as a preventive measure. Initially, the person requesting this procedure was required not to be in a state of payment cessation, but this was soon allowed on the condition that the period of payment cessation did not exceed 45 days.[22]

Moreover, the uncertainty of accepting the appointment of a special agent for an enterprise in a state of cessation of payments in judicial practice may be due to the fact that such enterprises did not request the appointment of a special agent, not because the competent judicial authorities rejected their requests.

What can be concluded from this approach is that the French legislator has left a wide margin for actors in prevention to ensure sufficient flexibility for this procedure, given that debtor enterprises resort to it for its confidentiality, especially with the possibility of reversing the cessation of payments as indicated above. In our opinion, what supports this is that the provisions related to business difficulties have been and continue to be subject to amendments, the latest of which was in 2021. However, the generality of the article was not reviewed, even though the latest amendment affected it.[23]

In contrast, the possibility of appointing a special agent in the Moroccan Commercial Code is linked to the debtor enterprise facing difficulties in general that could disrupt its continuity, and specifically, social difficulties, those between partners, or those with the undertaking's regular business partners.[24] This is on the condition that these difficulties have not led it to a state of cessation of payments.[25]

Therefore, the Algerian legislator and other legislations that may adopt the special mandate procedure should define the material scope of the procedure precisely. This could be done either by leaving the scope wide to ensure the required flexibility in this procedure, by allowing the targeted enterprises to request it even if they are in a state of cessation of payments for a specific period, or by defining the limits of eligibility by specifying the nature and level of the difficulties, such as setting the maximum limit as the enterprise's cessation of payments.

Section Two: Rules Concerning the Appointment of the Special Agent

The appointment of the special agent is subject to legally defined formalities and controls that differ between the comparative legislations under study, as are the limits of the authority granted to the court's President within these frameworks.

I – Appointment Procedures for the Special Agent and the Limits of the Court President's Authority

Article 549 of the Moroccan Commercial Code authorizes the President of the court to appoint a special agent and entrust them with the mission of intervening to mitigate objections and resolve the difficulties the enterprise is facing. This occurs when it becomes clear to the President – after hearing the head of the enterprise and forming a clear view of its situation – that the agent can resolve the difficulties and mitigate the objections that hinder the enterprise's continuity, especially those related to partners or regular business associates of the enterprise.[26]

However, the Code restricts the possibility of appointing a special agent by requiring that

* It is a preventive procedure that allows managers of enterprises facing difficulties to find simple and quick amicable solutions embodied in a confidential agreement to restore their enterprise's situation.

22 L611-4, C. Com, Fr.

23 Ibid., L611-3, Modified by Ordinance No. 2021-1193 of September 15, 2021 – Art. 4: "The President of the court may, at the request of a debtor, appoint an ad hoc agent whose mission he shall determine. The debtor may propose the name of an ad hoc agent. The decision appointing the ad hoc agent shall be communicated for information to the statutory auditors when they have been appointed. The competent court is the commercial court if the debtor carries on a commercial or craft activity, and the judicial court in other cases. The debtor is not required to inform the social and economic committee of the appointment of an ad hoc agent".

24 According to Article 550 of the Moroccan Commercial Code.

25 Ibid., Article 549.

26 Article 550 of the Moroccan Commercial Code.

the head of the enterprise propose them.* This is based on the rationale that the latter will be more serious in seeking solutions, leading them to choose who they see as the most competent for the task, and because doing otherwise would exacerbate the difficulties by burdening the enterprise with new fees.[27] In contrast, the issue of the limits of the court president's authority to accept or reject this proposal remains a legislative vacuum in Moroccan law.

Before this, the French legislator, through Article L611-3 of the French Commercial Code, allowed the President of the court to appoint a special agent upon the request of the debtor enterprise. The request must be submitted in writing by the legal representative of the legal person or by the natural person debtor to the President of the Commercial Court or the Judicial Court – as the case may be – within whose jurisdiction its headquarters is located, or, where applicable, within whose jurisdiction the natural person debtor has declared the address of their enterprise or activity.[28]

The request is filed with the court clerk's office along with documents that clarify the applicant's financial situation. The request must include the grounds on which it is based, the applicant's identity, and a summary specifying the type of activity, number of employees, turnover, and results, the difficulties encountered, the measures to be taken for continuity, and justifying how the appointment of a special agent would allow for the resolution of the difficulties. It must also affirm that the enterprise is not in a state of cessation of payments. The applicant may also include in the request the name of the person they propose for the mission.[29]

However, this proposal is not binding on the President of the court, who remains free to accept or reject the name of the proposed agent, as well as the freedom to accept or reject the appointment request as a whole, which is embodied in a decision they issue.* This decision, according to the provisions of Article R611-20* of the French Commercial Code, is subject to appeal by the debtor in accordance with the provisions of Article R611-26 of the same Code. This article stipulates that the debtor submits or sends the appeal by registered letter with acknowledgment of receipt to the court clerk. The court president rules on the appeal within five days of its submission, after which the debtor is notified, regardless of the decision.

While the court president's authority to accept or refuse the appointment of a special agent – without considering the proposed name – is justified by being linked to their conviction about the special agent's ability to mitigate objections and resolve the enterprise's difficulties, some argue that the discretionary power left to the President to accept or refuse the debtor's proposal is inappropriate. This is not only in view of the voluntary and spontaneous nature of the debtor's request but also due to the trust required for success in such a mission. They argue, in contrast, that it would be more appropriate to require the President of the court to accept the debtor's choice or, at the very least, compel them to justify their refusal of the proposed person. The refusal of the debtor's proposal could be an exceptional measure to make the plan more effective, especially since the debtor may be prepared to reject the intervention of an agent other than the one

* From the terminology of the third paragraph of Article 549 of the Moroccan Commercial Code, "The president of the court shall appoint the special agent... upon the proposal of the head of the undertaking...", it is understood that the appointment is linked to the proposal. This is especially so as the Code has bypassed the issue of the extent to which the opinion of the court president and the head of the undertaking on the person of the special agent may align or conflict. Conversely, the failure to address the issue may be an oversight by the Moroccan legislator.

27 Shamaia, A. (2018). *Sharh Ahkam Nizam Mu'alajat Sa'ubat al-Muqawala fi Daw' al-Qanun 17-73* [Explanation of the Provisions of the System for Handling Undertaking Difficulties in Light of Law 17-73]. Dar Al-Afaq Al-Maghribia, p. 65.

28 R600-2, C. Com, Fr.

29 Schwartz, M. G. (2013). The concept of the ad hoc mandate. Doctoral thesis, University of Poitiers, pp. 220-221.

* Nevertheless, the court's President may not appoint a special agent whose appointment has not been proposed by the debtor enterprise without first obtaining the latter's consent to the terms of their fees or remuneration, based on the second paragraph of Article R611-47-1 of the French Commercial Code.

* This appears to be a typo in the source text. The provision for appeal is in Article R611-20 of the French Commercial Code.

they proposed, by requesting the judge to terminate that agent's mission under the provisions of Article R611-21 of the French Commercial Code.[30] Furthermore, the latter law specifies the conflicts of interest related to the special agent to ensure their neutrality.

II – Conflicts of Interest Pertaining to the Special Agent:

In practice, special agents, as well as conciliators, are often former consultants, lawyers, former judges, administrators, agents, or retired accountants, etc., due to their competence and knowledge of companies and business. This makes it possible to appoint a person who was providing a service to the debtor enterprise, or even an employee, during the period preceding the appointment, which could undermine the neutrality required by their function and discourage creditors from responding to their requests.[31]

Therefore, to avoid conflicts of interest and to ensure the required independence that the special agent needs while performing their negotiation-based mission, the French legislator, unlike the Moroccan legislator, has prohibited the appointment of a group of persons as a special agent. Article L611-13 of the French Commercial Code stipulates that the duties of a special agent may not be performed by a person who has received, in any capacity, directly or indirectly, remuneration or payments from the debtor enterprise.* From any creditor of the debtor enterprise, or any person under its control as defined by Article L 233-16 of the French Commercial Code.[32] An exception is made if the person has received such remuneration under a special mandate or a judicial mandate entrusted to them in the context of an amicable settlement or a conciliation procedure concerning the same debtor enterprise or its creditors. Also included in the exception is remuneration received by a person under a judicial mandate, other than the commissioner for the execution of the plan, in the context of a reorganization* or judicial settlement* Procedure.

In the same context, the article also provides that the duties of a special agent cannot be entrusted to a consular judge* who is currently in office or who has left office for less than five years.

Suppose the President of the court appoints

30 Balemaken, E. L. R. (2013). The judge and the rescue of businesses in difficulty in OHADA law and French law: A comparative study. Doctoral thesis, Université Panthéon-Assas, p. 79.

31 Schwartz, M. G. (2013). The concept of the ad hoc mandate. Doctoral thesis, University of Poitiers, pp. 200-201.

* It should be noted that in the case where the debtor enterprise is a sole proprietorship with limited liability or a self-employed entrepreneur under the conditions specified in Section 3 of Chapter VI of Title II of Book V of the French Commercial Code, the assessment of the existence of remuneration or payments received by the person from the debtor enterprise is made with respect to all the assets held by the latter, not limited to the assets allocated to the specific activity, based on the first paragraph of Article L611-13 of the French Commercial Code.

32 Article L 233-16 of the French Commercial Code provides for two types of control: exclusive control and joint control. The first is achieved in the following cases: 1° When the controlling company holds, directly or indirectly, a majority of the voting rights in another company called the subsidiary; 2° When the controlling company has appointed the majority of the members of the administrative, management, or supervisory bodies of another company for two consecutive financial years, considering that the controlling company holds, directly or indirectly, a portion exceeding 40 percent of the voting rights, and no other partner or shareholder holds, directly or indirectly, a larger portion; 3° When the subsidiary has the right to exercise a decisive influence over a project under a contract or statutory provisions permitted by applicable law. Joint control is achieved when control over jointly managed projects is shared with a limited number of partners or shareholders, such that decisions result from their agreement.

* This is a procedure that helps to prevent debtor enterprises from bankruptcy in general through a rescue plan prepared and presented by the enterprise's management, the enrichment and supervision of which is handled by a professional appointed by the competent judicial authorities.

* This is a collective procedure that opens a consultation between the competent court and the representatives of the enterprise in cessation of payments, under the supervision of the public prosecutor's office and the employees, with the aim of preserving the enterprise's continuity.

* A consular judge (juge consulaire) is the name given to merchants, artisans, or service providers elected for a term of two or four years to sit alongside professional judges in French courts, including commercial courts.

the special agent. In that case, the court clerk notifies the concerned person of their appointment as a special agent by letter, accompanied by a letter containing the text of Article L611-13 on conflicts of interest. Upon accepting the appointment, the special agent must declare on their honor that they do not fall within the prohibitions of its text. They, in turn, inform the President of the court of their acceptance of the appointment.[33] And then begin their mission as special agents to mitigate the objections facing the enterprise.

Based on the foregoing, should the Algerian legislator, and other legislations thereafter, adopt the special mandate procedure, they are called upon to regulate all matters related to the appointment of the special agent, from the appointment procedures and modalities, through the determination of the powers granted to the competent judicial authorities in this regard, to the definition of conflicts of interest related to the special agent, in order to ensure the latter's neutrality.

PART II: THE LEGAL FRAMEWORK FOR THE SPECIAL AGENT'S MISSION

Like the French Commercial Code, the Moroccan Commercial Code has defined the general framework for the special agent's mission (Section One) to ensure that their duties do not overlap with those of the enterprise's management bodies. It has also worked to embody advantages within the special mandate procedure (Section Two) that are intended to support the success of the special agent's mission.

Section One: The General Framework of the Special Agent's Mission

In this section, we will clarify the mission of the special agent by explaining its limits. We will then address the criteria and conditions for determining the remuneration – the fees – that the special agent receives for carrying out their mission.

I – The Limits of the Special Agent's Mission

The French Commercial Code, under Article L611-3, stipulates that the court president appoints a special agent whose mission he defines. Similarly, Article R611-19 of the same law confirms that the order of the court president appointing the ad hoc agent specifies their mission.

In the same context, the Moroccan Commercial Code[34] stipulates that the President of the court is authorized to appoint the special agent and define their mission and duration, considering that the special agent's tasks vary depending on the size of the enterprise, the type of its activity, and even the nature of the difficulties it faces.

This means that the court's President determines the content and duration of the special agent's mission in the order he issues for their appointment, which corresponds precisely to the debtor enterprise's request and needs.

Generally, the special agent's mission has three main stages. In the preparation stage, the special agent undertakes to understand the enterprise's situation and obtain a general overview to prepare an action plan in coordination with the debtor. This enables them to negotiate with the concerned parties in the second stage.[35] In this context, the first paragraph of Article L611-3 of the French Commercial Code provides that the decision appointing the special agent, when made, is sent to the statutory auditors to facilitate their access to information that helps them form an idea of the enterprise's situation and identify its strengths and weaknesses, which may lead them to identify the causes of the difficulties and work to resolve them in a later stage.

In the second stage, the special agent and the debtor enterprise, through their representatives, begin negotiations with the concerned parties. This may be internal with the enterprise's main partners or external with its regular associates or main creditors, including banks. The substance of these negotiations may involve negotiating deadlines and/or debt reductions. In the same context, the agent may suggest finding a partner to invest funds if an agreement for existing shareholders to inject new funds cannot be reached.[36] They may

33 R611-20, C. Com, Fr.

34 Third paragraph of Article 459 and Article 550 of the Moroccan Commercial Code.

35 Schwartz, M. G. (2013). The concept of the ad hoc mandate. Doctoral thesis, University of Poitiers, p. 240.

36 Delebecque, P., Germain, M. (2011). Comprehensive Commercial Law: Commercial Instruments, Banks and Stock Exchanges, Commercial Contracts, Col-

also propose restructuring the enterprise or selling a part of it.[37]

It is important to note at this stage that the work of the special agent does not affect the powers and obligations of the enterprise owner. The latter retains their authority and continues to manage the business without being stripped of it, while receiving the assistance of the special agent who cannot substitute for them. The role of the special agent is to help the head of the enterprise restore confidence in the enterprise from both shareholders and creditors. At the same time, the special agent must inform the President of the court who appointed them through periodic reports, updating them on the state of the business, its development prospects, and any difficulties encountered.[38]

The court president may find from the special agent's reports that the success of the mission is linked to extending its deadline or replacing the agent. He may then extend the deadline or replace the agent, as the case may be, all after obtaining the consent of the enterprise owner.[39]

In a final stage, the special agent seeks to conclude an agreement that makes it possible to ensure the enterprise's continuity by preserving its activity and associated employment. This is done by bridging the gap between what the concerned enterprise facing difficulties can agree to and what the main creditors can accept.[40]

The special agent's mission ends upon its completion – the conclusion of the agreement – or at the end of the period specified in the order by the President of the court, unless it is extended based on the progress of the work.*

Ultimately, the special agent's mission remains subject to the discretion of the debtor enterprise. Whenever it appears to them that the special mandate is not sufficient to achieve the desired continuity, they may request the President of the court to terminate the special agent's mission, which the agent must then end immediately.[41]

II – How the Special Agent's Remuneration is Determined

Unlike the Moroccan Commercial Code, the French Commercial Code regulates how the special agent's remuneration is determined, moving away from a fee schedule and allowing for contractual freedom. This is the case even though practice confirms that the determination of the special agent's fee* is often done by agreements between the debtor enterprise and the special agent before the request to open the special mandate procedure is submitted to the President of the competent court.[42]

The French Commercial Code has entrusted the competent court president with the task of determining the criteria for the special agent's remuneration and its maximum amount, and, where applicable, its sum or method of payment.[43] This is done through an appealable order.* issued at the time of the special agent's appointment, in

lective Proceedings (Part II; A. Moukalled, Trans.). University Establishment for Studies, Publishing and Distribution, p. 1214.

37 Saint-Alary-Houin, C. (2020). Law of businesses in difficulty (12th ed.). LGDJ, Domat., p. 192.

38 Schwartz, M. G. (2013). The concept of the ad hoc mandate. Doctoral thesis, University of Poitiers, p. 80.

39 Last paragraph of Article 550 of the Moroccan Commercial Code. While there is no corresponding article in the French Commercial Code, this is reflected in actual practice.

40 Marie Goncalves Schwartz, op. Cit, p. 241.

* The President of the court can deduce from the periodic reports submitted to him by the special agent.

41 R611-21, C. Com, Fr.

* The same applies to a conciliator, as they are subject to the same provisions governing their fees or remuneration.

42 Koehl, M. (2019). Negotiation in the law of businesses in difficulty. Doctoral thesis, Université Paris, p. 75.

43 R611-47, C. Com, Fr.

* The court clerk notifies the order setting the fees to the special agent and the debtor enterprise. He also immediately notifies the public prosecutor if conciliation is used to determine the fees. It can be appealed by the special agent or the debtor before the first president of the Court of Appeal, noting that the appeal is submitted and heard within the time limits and conditions provided for in Articles 714 to 718 of the French Code of Civil Procedure, based on Article R611-50 of the French Commercial Code.

* Because the President of the court works to inform the public prosecutor to give their opinion, suppose the public prosecutor does not give their opinion. In that case, the President of the court cannot open the special mandate procedure before the expiration of forty-eight hours from the date of notification, according to the third paragraph of Article R611-47-1 of the French Commercial Code.

light of the diligence required to accomplish the mission, and after taking the opinion of the public prosecutor.* Moreover, the consent of the debtor enterprise must be obtained, which is recorded in writing and attached to the appointment order.[44] However, the remuneration may not be linked to the amount of debt write-offs obtained, nor can it be a lump sum for opening the file.[45]

The possibility of reconsidering the remuneration remains. The special representative's fee during their mission may prove insufficient because the work that needed to be done was more significant than what was initially planned. Whenever the special agent finds that the maximum remuneration set by the order is insufficient, they inform the President of the court. The latter then determines, if necessary, the new terms of remuneration in agreement with the debtor enterprise and, after taking the opinion of the public prosecutor, if conciliation is used to determine the new terms regarding the agent's fees. If no agreement is reached on the latter, the special agent's mission ends.[46]

At the end of the mission, based on the services rendered, the President orders the payment of the special agent's remuneration by an order.[47]

Section Two: Advantages of the Special Mandate Procedure

The special mandate procedure is characterized by several advantages that contribute to the success of the special agent's mission. It allows the head of the enterprise to, in complete confidentiality, enlist a specialized person to assist in resolving the difficulties facing their enterprise with great simplicity and flexibility.

I – Confidentiality

The procedures for appointing a special agent and their performance of the mission demand confidentiality. The spread of news about the appointment of a special agent for an enterprise could lead business partners to cease dealing with it, or it could cause some creditors to suddenly resort to individual actions to protect their rights, thereby exacerbating the difficulties and widening the gap between the enterprise and its partners. All of this complicates the special agent's task or renders it futile. Conversely, the commitment of all actors in the special mandate procedure to confidentiality contributes to the success of the special agent's mission. Therefore, the French Commercial Code stipulates that anyone summoned to the proceedings related to the special mandate, as well as anyone who becomes aware of it by virtue of their function, must maintain confidentiality.[48]

Inspired by French legislation, Moroccan legislation has adopted this feature as an important element. It also enshrines the necessity of maintaining the confidentiality of the special mandate procedure in all its stages: from the court president's summons of the head of the enterprise through the appointment procedures for the special agent to the latter's performance of their duties.[49]

It should be noted that non-compliance with the confidentiality obligation constitutes a fault that subjects the violator to paying damages to compensate for the harm caused by the breach, in accordance with the general rules of civil liability. This is unlike the breach of professional secrecy, for which applicable legislation imposes criminal penalties, as it is considered a crime.[50]

44 R611-48, C. Com, Fr.

45 Ibid., R611-49.

46 Ibid., L611-14, para. 01.

47 Bouquet, B. (2008, January/February). Ad hoc mandate and conciliation: a renovated legal tool. R J C, (1), 4.

48 L611-15, C. Com, Fr.

49 Last paragraph of Article 549 of the Moroccan Commercial Code.

50 Schwartz, M. G. (2013). The concept of the ad hoc mandate. Doctoral thesis, University of Poitiers, p. 287).

* A judgment from the Court of Appeal of Grenoble in France supports this. In summary, to enable a group of companies preparing for a major acquisition, a consortium of banks met to finance the operation. The group of companies experienced financial difficulties, particularly with its cash flow, and consequently requested a renegotiation of its loan repayment schedule. Subsequently, the group faced further financial difficulties, leading two subsidiary companies to request the benefit of a special mandate in September 2006 to assist in their negotiations with the banking consortium for the renegotiation of the previously agreed loan schedule. This resulted in the opening of a conciliation procedure, and an agreement was subsequently approved in February 2007. The group experienced

Alongside this, the principle of confidentiality should not undermine the trust between the actors in the special mandate procedure, such as the head of the enterprise using it to gain financial advantages from their partners, especially lenders.* On the other hand, the head of the enterprise must earn the trust of the enterprise's partners by entrusting them with all useful information about the enterprise to allow the concerned parties first to understand the origin of the difficulties, and then work to find prospects for resolving them through agreements that preserve everyone's interests. In other words, as much as confidentiality is necessary in the special mandate procedure to protect the enterprise facing difficulties, the dissemination of transparent information within a limited and defined circle must be allowed, which is essential for fair negotiation.[51]

II – Flexibility and Simplicity

This is evident in the special mandate procedure through its contractual nature, which is embodied by the few provisions that regulate its course compared to other amicable preventive and curative procedures.* Furthermore, these few provisions have made the debtor enterprise, through its representatives, the main controller of the procedure during most of its stages. The submission of a request to open the special mandate procedure and appoint the special agent depends on the will of the debtor enterprise through its legal representative; no other party can compel it to do so. It can also invite specific creditors to the procedure and not others, on the grounds that the objections against the enterprise came from them, or because the enterprise believes they are best able to support it due to their connection to it, or the mutual trust between them. The participation of these creditors remains subject to their own will.

Flexibility and simplicity are also apparent in the fact that the law does not define the special agent's mission, unlike the mission of the conciliator.* In the conciliation procedure. Instead, this is left to the President of the competent court, who defines the special agent's mission to perfectly suit the debtor's request and the enterprise's needs without conflicting with the will of its management. In addition, the special agent's mission is not limited to a specific duration; the latter is determined according to the nature of the mission, the size of the enterprise, and other factors.

new financial difficulties in the first half of 2007, and a second conciliation was conducted in July 2007 to find new investors. A conciliation protocol was established in November 2007, providing for several restructuring and loan rescheduling operations. Despite this continued banking support, the statutory auditor, in July 2008, informed the shareholders – in application of the duty to alert – of facts likely to compromise the continuity of operations. Faced with this growing deterioration, the group's companies requested the appointment of a new conciliator in September 2008. Two meetings were held between the banking consortium and the concerned companies, which failed to inform the consortium about the alert procedures and the appointment of the conciliator. However, one of the banks discovered the existence of the auditor's alert procedures and the opening of the conciliation procedure, and decided to terminate the contractual relationship in October 2008, based on the failure to be informed about the alert procedures and the conciliator's appointment. In response, the group's companies declared a cessation of payments, and judicial settlement proceedings were opened against them in November 2008, leading to their liquidation through a sale plan in March 2009. The liquidator subsequently filed a claim for damages against the bank that cut off the credit facilities. The Commercial Court of Grenoble issued a judgment on January 10, 2010, ordering the bank to pay. However, the appellate judgment overturned this, considering the managers' conduct to be disloyal because they did not inform the banking consortium that their companies were subject to alert and conciliation procedures. For more details on the judgment, see: Court of Cassation, Commercial Chamber. (2012, February 7). Judgment No. 10-28.815, 10-28.816] [Unpublished]. <www.legifrance.gouv.fr/juri/id/JURITEXT00002535783>.

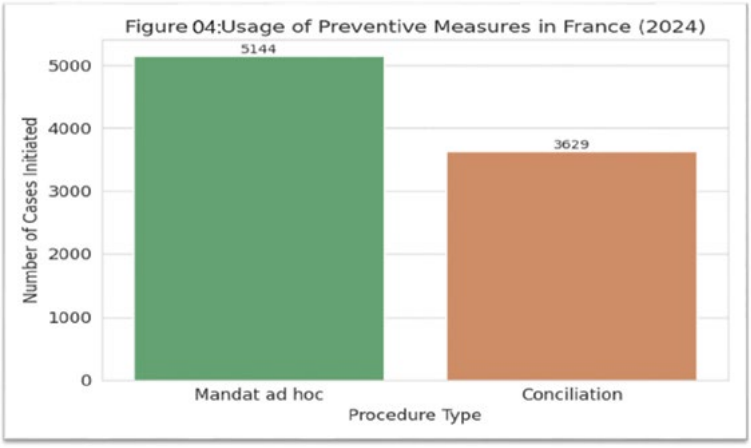
51 Schwartz, M. G. (2013). The concept of the ad hoc mandate. Doctoral thesis, University of Poitiers, pp. 290-293.

* These provisions mainly regulate the independence of the special agent and the criteria for determining their fee, as previously discussed.

* The mission of the conciliator generally consists of mediating between the debtor enterprise and its creditors to bring their views closer together, in the hope of resolving the difficulties facing the debtor enterprise and achieving the required continuity. This is primarily found in Article L 611-7 of the French Commercial Code and Article 554 of the Moroccan Commercial Code.

Table 2. *Usage of Preventive Measures in France (2024)*

PREVENTIVE PROCEDURE TYPE (FRANCE 2024)	NUMBER OF CASES INITIATED
Special Mandate (Mandat ad hoc)	5,144
Conciliation	3,629
Total	8,773



In the same vein, only the enterprise, through its representatives, has the right to terminate the procedure at any time it deems appropriate, even if the special agent's mission has not ended, by informing the competent court president, who will then terminate the procedure immediately, as previously mentioned.

This combination of confidentiality and flexibility has made the Special Mandate a cornerstone of the French preventive system, not just in theory but in practice. This heavy reliance on preventive, out-of-court mechanisms demonstrates a widespread "culture of pre-emption" and trust in the system, a key factor in its economic success. In 2024, French courts initiated 5,144 Mandat ad hoc procedures and 3,629 Conciliation procedures (CNAJMJ, 2025). (See Table 2)

Despite the advantages of the special mandate procedure, its limits, primarily drawn by its contractual nature, give rise to some shortcomings. These include the impossibility of preventing creditors who are not parties to the agreement from continuing to sue the debtor enterprise, a common challenge in pre-insolvency frameworks across the EU before recent reforms.[52] It also does not provide any additional guarantee to the creditors who are committed within the agreement, as it is not subject to approval by the competent judicial authority. This may create an urgent need for another procedure that blends a contractual nature with a degree of judicial control, such as the conciliation procedure.

Based on the foregoing, should the Algerian legislator and other legislations thereafter adopt the special mandate procedure, they are called upon to regulate the legal framework of the special agent's mission. This should be done by defining the limits of this agent's mission to ensure no overlap between their tasks and the tasks of the enterprise's managers during the procedure, as well as by clarifying the criteria and methods used to determine the special agent's fees in all cases. In all this, a sufficient degree of flexibility and simplicity should be ensured, alongside imposing the required confidentiality in the procedure, to make it an attractive option for managers of enterprises facing difficulties to the extent legally defined.

52 European Commission. (2022). Insolvency Frameworks across the EU: Challenges after COVID-19 (Discussion Paper 182).

CONCLUSION

In conclusion to this comparative study, it is evident that the special mandate procedure represents a vitally important preventive tool, granting enterprises facing difficulties an opportunity to overcome them within a framework of confidentiality and flexibility. The comparison between the French and Moroccan experiences has revealed two different philosophies. The French legislator has adopted a broad and flexible approach, both in terms of the scope of beneficiaries and the assessment of the enterprise's situation, while establishing detailed procedural rules that guarantee the rights of all parties. In contrast, the Moroccan approach has been characterized by a relative restriction in the procedure's scope of application. There are some legislative vacuums concerning the judge's authority and the conflicts of interest related to the agent.

The success of this procedure hinges on achieving a delicate balance between its contractual nature, which grants it flexibility, and the establishment of a clear legal framework. However, the key finding of this study is that the French model's success is not merely legal; it is economic. The French framework's flexibility directly correlates with superior economic outcomes: a 2.6-fold higher debt recovery rate, a process that is nearly twice as fast, and an outcome that favors business continuity rather than piecemeal liquidation, when compared to the more restrictive Moroccan model.

Accordingly, this study recommends that the Algerian legislator and other legislations, when adopting such a procedure, should draw inspiration from the French experience, not only for its legal comprehensiveness but for its proven economic results.

The establishment of such mechanisms not only contributes to rescuing enterprises but also instills a culture of pre-emption and early recourse to the judiciary, which enhances confidence in the economic climate and supports its stability by providing a credible, efficient path for investors and creditors to recover value, as evidenced by France's high-performing insolvency indicators. This aligns with a growing international consensus that efficient, modern insolvency laws are critical infrastructure for economic renewal, investment, and sustainable (OECD, 2022; EBRD, 2022; UNCTAD, 2024).

Based on the foregoing, we present the following recommendations:

- Establish a personal scope that includes all enterprises contributing to development, avoiding unjustified selectivity based on commercial status. However, it may be advisable to start by limiting the scope to the most significant enterprises before expanding it later, considering the necessary resources in the form of specialized agents and judges;
- Regulate all matters related to the appointment of the special agent, starting from the appointment procedures and modalities, through the determination of the powers granted to the competent judicial authorities in this regard, to the definition of conflicts of interest related to the special agent, to guarantee the latter's neutrality;
- Define the legal framework for the special agent's mission by specifying its limits to ensure no overlap between their tasks and the tasks of the enterprise's managers during the procedure. Clarify the criteria and methods used to determine the special agent's fees in all cases. In all this, a sufficient degree of flexibility and simplicity should be ensured, alongside imposing the required confidentiality in the procedure, to make it an attractive option for managers of enterprises facing difficulties to the extent legally defined.

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ARTICLE

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FINTECH AND FOREIGN TRADE IN ALGERIA: Opportunities, Challenges, and Strategic Imperatives for the Banking Sector

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Abstract. This research explores the impact of FinTech on Algeria's foreign trade and how the banking sector is adapting to digital innovation. Using a mixed-methods approach integrating statistical data with expert analysis, the study evaluates digital tools' influence on trade activities. The findings reveal inconsistent progress: while some banks have embraced FinTech, reaping benefits in efficiency, risk management, and compliance, the industry still grapples with outdated infrastructure, regulatory inflexibility, and low digital literacy. However, signs of progress emerge, especially in mobile payments and blockchain technologies.

Drawing on international case studies and regional comparisons with Kenya, India, the UAE, and Brazil, the paper identifies concrete actions to propel Algeria forward through focused investment in digital infrastructure, regulatory reform, and bank-FinTech collaboration. By systematically comparing regional trends and reviewing global implementation experiences, the study proposes specific, time-bound interventions tailored to Algeria's institutional landscape: a phased investment plan of USD 380-470 million over five years, focused on digital infrastructure upgrade, regulatory reform, strategic alliances with mature FinTech platforms, and structured capacity building.

The study sets concrete goals: cutting transaction times from 5-7 days to 24-48 hours, boosting trade finance digitization from 15-20% to 75%, and extending financial inclusion from 43% to 60% of adults by 2030. The research concludes that greater FinTech adoption in Algeria's banking and trade sectors could improve competitiveness in global markets, but only with concerted implementation supported by institutional will and resource allocation.

KEYWORDS: FINANCIAL TECHNOLOGY, FINTECH, FOREIGN TRADE, ALGERIAN BANKS, TRADE FINANCE, DIGITAL TRANSFORMATION, INNOVATION POLICY.

INTRODUCTION

The rapidly growing field of FinTech has revolutionized finance in new ways, transforming how people conduct business with banks today. More specifically, at the intersection of FinTech and foreign trade, businesses now have new ways to conduct business with other countries that are faster, safer, and more cost-effective. This paper examines the application of FinTech solutions by Algerian banks to enhance their foreign trade techniques, thereby improving the country's economic growth and competitiveness. The potential of FinTech in Algeria is vast, and this study aims to shed light on its promising future. The paper will examine the specific strategies employed by Algerian banks to identify critical FinTech innovations that are best suited for facilitating cross-border trade. It will also help explore the challenges and opportunities of deploying these technologies and provide a viewpoint regarding their dual development paths.

To guide this investigation, the study addresses the following research questions:

- What specific FinTech solutions have Algerian banks implemented to support their foreign trade operations?
- How have these FinTech solutions influenced efficiency, cost reduction, and risk management in foreign trade processes?
- What are the main barriers and enablers for FinTech adoption in Algeria's banking sector?
- How can Algerian banks and policymakers leverage FinTech more effectively to improve foreign trade competitiveness and economic growth?

In line with these research questions, the objectives of this study are to:

- Identify and categorize the key FinTech innovations currently used by Algerian banks, particularly in trade finance;
- Evaluate the impact of these technologies on operational performance indicators such as transaction speed, cost-efficiency, and security;
- Examine the institutional and regulatory factors influencing FinTech adoption in Algeria.

By combining regional comparisons, theoretical insights, and a contextualized understanding of the Algerian banking sector, this study aims to contribute to both academic discourse and practical policymaking in the fields of digital finance and international trade.

1. FINTECH AND TRADE TRANSFORMATION

Financial technology (FinTech) represents a paradigm shift in how financial services are developed, delivered, and consumed. At its core, FinTech integrates advanced technologies, including blockchain, artificial intelligence (AI), machine learning, and big data analytics, into traditional banking systems. These technologies disrupt conventional financial operations by offering faster, more secure, and customer-centric services.[1] However, while FinTech has spurred financial inclusion in various global contexts – especially in developing regions where conventional banking systems are underdeveloped – its success is not uniform across different economies. For example, Islamic FinTech has become a niche market that meets the financial needs of people who follow Sharia law. It is growing in countries like Malaysia and the UAE, but it is still underdeveloped in Algeria.[2] The COVID-19 pandemic sped up the use of FinTech around the world, but Algeria's progress has been much slower, showing that there is still a gap in both infrastructure and institutional readiness. This delay has made people wonder about the structural and policy-based barriers that are holding back digital financial innovation in the country.[3] Adding to this complexity, scholars

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2 Webb, H. C. (2024). Sectoral system of innovation in Islamic FinTech in the UAE's regulatory sandbox. In: The Palgrave Handbook of FinTech in Africa and the Middle East: Connecting the Dots of a Rapidly Emerging Ecosystem, Singapore: Springer Nature Singapore, p. 12.

3 Muza, O. (2024). Innovative governance for transformative energy policy in sub-Saharan Africa after COVID-19: Green pathways in Egypt, Nigeria, and South Africa. Heliyon, 10(9), p. 266. <doi.org/10.1016/j.heliyon.2024.e26600>.

have debated how much FinTech really makes it easier for everyone to get financial services. Some people say that FinTech makes it easier for people to get involved and lowers the barriers to entry. Critics, on the other hand, warn that FinTech could exacerbate digital divides and increase system vulnerabilities if there is insufficient regulation and infrastructure in place.[4] In Algeria, these worries are especially important because of the lack of regulatory action and the strong hold that state-owned banks have on the market, which together make it harder for the ecosystem to adapt to changes brought about by FinTech. The FinTech landscape is also not the same all over the place. In economies that are digitally advanced, FinTech services cover a wide range of areas, such as neo banking, regtech, digital payments, and investment platforms. In Algeria, on the other hand, FinTech is still mostly limited to mobile payments and basic e-banking services. This difference in the range of technologies used shows that Algeria is not as developed as other countries and shows that it is an important but not well-studied case in the international FinTech conversation. Foreign trade methods have also changed in response to changes in technology and politics, just like FinTech has. Modern trade is based on barter systems and has been shaped by industrialization and colonialism. It now relies heavily on electronic trading platforms, AI-powered risk management tools, and real-time currency analytics.[5] These new ideas are now standard in global trade and are necessary for making things more open, lowering costs, and making them easier to get to. As economies around the world have started to use more digital trade methods, China's use of digital tools in its Belt and Road Initiative is an example of how big data and AI are used in trade networks to encourage strategic partnerships.[6] Algeria, on the other hand, still uses old systems and manual processes, which makes things less efficient and costs more to run. This omission illustrates a more extensive concern: the lack of a cohesive strategy that amalgamates FinTech with trade modernization and sustainability.[7] This deviation from global standards highlights a significant theoretical deficiency in the literature. Even though trade modernization is seen as important for a country's competitiveness, there isn't much research or thought about how digital financial infrastructure – especially in countries like Algeria.[8] Moreover, the intersection between FinTech and foreign trade has emerged as a critical theme in discussions about modern economic transformation. FinTech innovations increasingly play a pivotal role in enhancing the speed, security, and transparency of cross-border transactions. These include improved payment systems, increased access to trade finance, dynamic currency exchange tools, and more efficient supply chain management solutions. While blockchain-based platforms, such as IBM TradeLens and Contour, are now streamlining trade documentation and reducing fraud in many countries, these innovations remain virtually absent in Algeria's banking sector.[9] At the same time, comparable emerging economies have made more substantial progress. Kenya, for instance, has enabled SME participation in international trade through M-Pesa, while India has simplified cross-border financial access using its Unified Payments Interface (UPI). Both cases illustrate how FinTech can serve as a bridge for financial inclusion and SME empowerment. In Algeria, however, despite facing similar structural challenges, these transformative models have yet to be adopted.[10] Further evidence in the litera-

4 Xu, D., Xu, D. (2020). Concealed risks of FinTech and goal-oriented responsive regulation: China's background and global perspective. Asian Journal of Law and Society, 7(2), p. 312.

5 King, M. R., Osler, C., Rime, D. (2012). Foreign Exchange Market Structure, Players, and Evolution. In: Handbook of exchange rates, pp. 1-4.

6 Liu, W., Dunford, M., Gao, B., Lu, Z. (2018). The Belt and Road Initiative: Reshaping global trade and development. Journal of Contemporary China, 27(112), p. 451.

7 Oguntuase, O. J. (2025). Consumer-focused transition to a bio-based, sustainable economy in Africa. In: Sustainable bioeconomy development in the Global South: Volume I – Status and perspectives, Springer Nature Singapore, p. 347.

8 Seddiki, S. (2023). The role of financial technology (FinTech) in overcoming the financing gap for MSMEs in Algeria. El-Bahith Review, 23(1), p. 56.

9 Carè, R., Boitan, I. A., Stoian, A. M., Fatima, R. (2025). Exploring the landscape of financial inclusion through the lens of financial technologies: A review. Finance Research Letters, 72, p.165. <doi.org/10.1016/j.frl.2024.106500>.

10 Musa, B. O. (2022). Effect of financial innovations on

ture highlights how FinTech platforms that utilize alternative data can improve credit assessments and expand access to capital for underserved enterprises.[11] In a country like Algeria, where over half the adult population remains unbanked and SMEs face bureaucratic hurdles in securing trade finance, these digital solutions could offer critical support. However, widespread adoption is hindered by low financial literacy, centralized banking control, and a lack of institutional flexibility. Additionally, FinTech's potential in enhancing supply chain operations through smart contracts, blockchain, and real-time tracking is widely acknowledged in global trade ecosystems.[12] This study thus fills a critical analytical gap by situating FinTech within the specific financial, policy, and trade ecosystems of Algeria, offering a contextualized perspective on its opportunities and constraints.

2. METHODOLOGY

This study employs a qualitative, exploratory research design, supported by descriptive and comparative analytical techniques, to investigate the adoption and impact of financial technology (FinTech) on the foreign trade operations of Algerian banks. Given the limited prior empirical research and the early stage of FinTech implementation in Algeria, this approach allows for a deep, contextual understanding of systemic barriers, institutional dynamics, and technological developments. A qualitative framework is particularly suited to examining the layered regulatory, infrastructural, and socio-political dimensions of FinTech in a low-adoption environment. While no primary data were collected, this decision was methodologically deliberate. Due to the nascent and under-documented nature of FinTech in Algeria's trade finance sector, the study prioritized triangulated secondary data analysis to build a foundational understanding. Additionally, constraints related to access, institutional approvals, and the sensitivity of financial-sector interviews during the research timeline limited the feasibility of primary fieldwork. To offset this, a rigorous multi-source strategy was employed, ensuring analytical depth and reliability.

2.1 Data collection

Data were compiled from multiple authoritative sources to capture a comprehensive view of Algeria's FinTech landscape, with specific attention to foreign trade practices:

- Academic and Industry Literature: Peer-reviewed journal articles, policy studies, and industry white papers (e.g., World Bank, IMF, Statista) were used to map global and regional FinTech developments and establish theoretical baselines;
- Regulatory and Governmental Documents: Key Algerian legislative texts, central banking decrees, financial sector reform reports, and regulatory guidelines were examined to assess institutional frameworks shaping FinTech integration;
- Quantitative Market and Sectoral Data: Databases providing FinTech usage statistics, mobile penetration metrics, digital transaction trends, and trade finance benchmarks (from both domestic and international sources) were reviewed for contextual comparison and empirical support;
- Case Studies and Institutional Examples: Specific FinTech platforms and financial institutions – such as Yassir, UbexPay, Natixis, and Lloyds Bank – were analyzed to illustrate business models, innovation strategies, and localized applications relevant to the Algerian banking sector.

2.2 Analytical framework

A thematic content analysis was employed to identify and organize key patterns, barriers, and

financial inclusion: A case of small and medium enterprises in urban informal settlements in Nairobi County. Kenya (Doctoral dissertation, University of Nairobi), University of Nairobi, p. 78.

11 Hamid, A., Widjaja, W. S., Napu, F., Sipayung, B. (2024). The role of FinTech in enhancing financial literacy and inclusive financial management in MSMEs. TECHNOVATE: Journal of Information Technology and Strategic Innovation Management, 1(2), p. 85.

12 Kumar, N., Kumar, K., Aeron, A., Verre, F. (2025). Blockchain technology in supply chain management: Innovations, applications, and challenges. Telematics and Informatics Reports, 18(2), p. 204. <doi.org/10.1016/j.teler.2025.100204>.

enablers related to FinTech adoption in Algerian foreign trade finance. Data were coded inductively based on recurring concepts and organized around the study's four core research questions. Thematic categories included technological integration, regulatory dynamics, institutional inertia, and trade facilitation outcomes.

To ensure robustness, the analysis incorporated:

- Triangulation of data types (qualitative themes, quantitative indicators, and legal texts);
- Cross-case comparison with regional and global benchmarks to highlight Algeria's relative performance and constraints;
- Institutional theory lenses, especially regarding path dependency, bureaucratic rigidity, and market structure influences, to interpret adoption trajectories and policy inertia.

Although manual coding was used, consistency was maintained through repeated review cycles and synthesis matrices that mapped thematic findings against research objectives. This ensured methodological transparency and minimized subjective bias.

2.3 Scope and limitations

This study focuses exclusively on formal banking institutions involved in foreign trade finance in Algeria, with a special emphasis on digital payments, blockchain applications, and AI-powered trade tools. It does not comprehensively cover FinTech developments in insurance, crowdfunding, or cryptocurrency markets, nor does it include informal financial service providers.

Key limitations include:

- No primary fieldwork: Interviews and surveys could have provided stakeholder insights, but were excluded due to access limitations, regulatory sensitivity, and time constraints;
- Reliance on secondary data: Some information may be outdated, incomplete, or subject to institutional bias;
- Contextual specificity: Findings may not be generalizable to other MENA or developing economies without adaptation.

Nonetheless, methodological rigor was maintained through systematic source triangulation, documented coding procedures, and theoretical alignment with current scholarship on FinTech adoption in emerging markets.

2.4 Ethical considerations

This study is based entirely on publicly available secondary data, official documents, and published research. As such, it did not involve human participants and did not require institutional ethical approval.

3. GLOBAL PERSPECTIVES ON FINTECH IN FOREIGN TRADE

To consider how innovation and payment technology (FinTech) could influence the spheres of international trade, examining interesting case studies from various economies is helpful. These are two cases that exemplify how FinTech applications have helped businesses and governments surmount trade restrictions, expand their market presence, and improve efficiency.

3.1 Case studies from leading economies

United Kingdom: Beyond the Bean, a Bristol-based company, leveraged the Lloyds Bank International Trade Portal to expand into international markets. The portal provided essential market insights, economic data, and tools for managing trade documentation, facilitating strategic market entry.

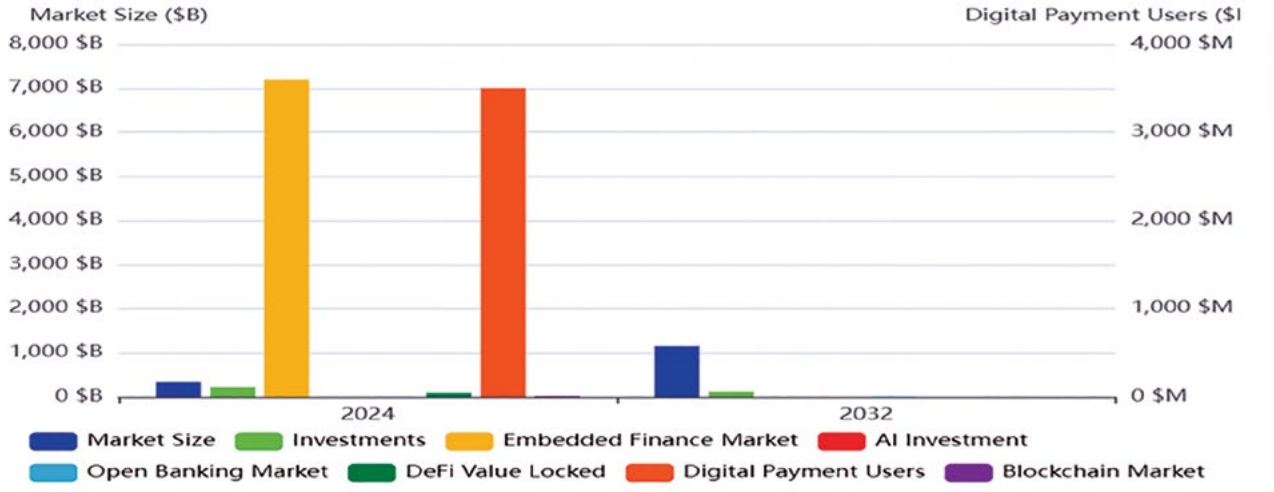
United States: Harlow Group, a metal fabrication firm, utilized Previse's InstantAdvance to address cash flow issues and secure materials at better prices. This FinTech solution provided critical short-term funding, enabling the company to handle larger orders and improve liquidity.[13]

Brazil: Nubank, a prominent FinTech bank, has significantly expanded financial inclusion, with 46% of Brazil's adult population using its services. This widespread adoption underscores FinTech's role in providing accessible financial services.

China: WeBank, China's digital bank, uses AI to offer efficient banking solutions to SMEs and the broader population. Its online-only model

13 Previse. (2024). InstantAdvance and trade finance. Available at: <https://previse.co/en-gb/success/harlow-group-on-financing-stock/> (Last access: 12.07.2025).

Figure 1. *FinTech Statistics for 2024*



enhances financial accessibility and operational efficiency.[14]

Africa: Mobile money platforms, such as M-Pesa, have transformed financial services across East Africa, North Africa, and South Asia. These platforms offer essential banking services to underserved populations, illustrating the impact of FinTech on financial inclusion.[15]

3.2 Key FinTech Innovations in International Trade

Blockchain Technology: Blockchain offers a secure, decentralized ledger for the real-time tracking of goods and payments, thereby reducing fraud and enhancing transparency in international trade. Smart contracts, coded agreements that execute automatically, streamline trade processes by minimizing the need for intermediaries.

Digital Payment Platforms: FinTech innovations in technology enable real-time, cost-effective transactions that bypass traditional banking inefficiencies. Mobile wallets and currency exchange platforms reduce transaction costs and support global expansion.[16]

Crowdfunding: Crowdfunding platforms enable businesses to raise capital from a diverse group of investors, supporting SMEs in financing export activities and market expansions. This model democratizes access to capital and promotes entrepreneurial growth.[17]

Artificial Intelligence and Big Data: AI and data analytics enhance trade decision-making by predicting trends, optimizing logistics, and improving risk assessments. These technologies help businesses navigate international markets more effectively.[18]

Regulatory Adaptations: Regulatory frameworks are evolving to accommodate FinTech innovations, with sandboxes allowing startups to test new products. This adaptive approach supports FinTech growth while ensuring compliance and consumer protection.[19]

3.3. FinTech worldwide

The FinTech industry in 2024 has shown significant growth and transformation across various sectors. (See Figure 1.)[20]

Market Size and Growth: The FinTech market is expected to exceed $340 billion in 2024, with a

14 WeBank. (2024). Available at: <https://www.webank.com.tn/fr/> (Last access: 12.07.2025).

15 Lloyds Bank. (2024). International Trade Portal case studies. Lloyds Bank. Available at: <https://www.lloydsbank.com/business/resource-centre/international-trade-portal.html> (Last Seen: 12.07.2025).

16 Chatterjee, S. (2023). Digital payments and global trade. Journal of Economic Integration, 31(1), p. 25.

17 Chen, Q. (2024). FinTech innovation in micro and small business financing. International Journal of Global Economics and Management, 2(1), p. 286.

18 Senyo, P. K. (2022). Big data analytics in trade. Trade Analytics Review, 16(1), p. 42.

19 Dahdal, E. M. (2020). Regulatory sandboxes for FinTech innovation. Regulatory Policy Journal, 15(1), pp. 78-95.

20 Statista. (2024). Industry overview. Available at: <https://www.statista.com/markets/> (Last access: 12.07.2025).

projected compound annual growth rate (CAGR) of 16.5%, reaching $1,152 billion by 2032.

Investment Trends: Despite the overall growth, investments in FinTech have declined. In 2021, investments totaled nearly $226 billion, but by 2023, they had decreased to $113.7 billion. This indicates a more selective approach by investors.

Embedded Finance: Embedded finance integrates financial services into non-financial businesses, representing a rapidly growing trend. The market for embedded finance is expected to reach $7.2 trillion by 2030.

AI in Personal Finance: AI-powered FinTech startups have seen steady investment growth, from $500 million in 2017 to $2.5 billion in 2023. AI applications in personal finance include budgeting, expense tracking, investment advice, bill payment reminders, and financial planning.

Central Bank Digital Currencies (CBDCs): Over 130 countries are exploring the development of their digital currencies. CBDCs are expected to create new opportunities for FinTech products and services.

Open Banking: The open banking market is projected to reach $11.7 billion by 2027, doubling from $5.5 billion in 2023. Open banking enables the secure sharing of customer data through APIs, fostering the development of new FinTech products, such as account aggregators and real-time fraud detection solutions.

Decentralized Finance (DeFi): Following a decline in investments in DeFi in 2023, an expected resurgence is anticipated in 2024. As of April 2024, the total value locked in DeFi platforms was $86.8 billion.

Digital Payments: Digital payment users are expected to reach over 3.5 billion by 2024. UPI platforms saw a record 13.4 billion transactions in March 2024.

Blockchain Technology: Blockchain technology is set to hit $20 billion by 2024. Digital lending through blockchain is projected to rise to $567.3 billion by 2026, with a CAGR of 26.6%.

Artificial Intelligence: AI will power 95% of all customer interactions within the next decade, with consumers expected to prefer interaction with machines over humans. (See Figure 2.)[21]

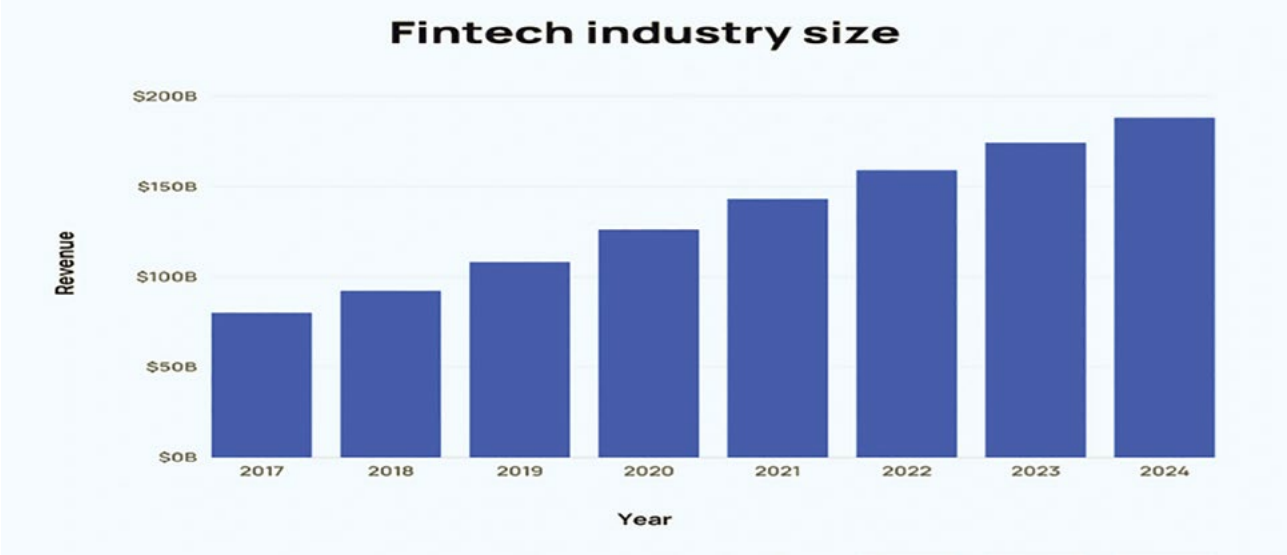
The diagram depicts the upward trend in revenue within the FinTech sector from 2017 to 2024. The graph indicates a steady and considerable rise in revenue throughout the years, highlighting the swift development of the FinTech industry globally.

Primary observations:

- 2017-2020: Consistent growth of the industry; revenues;
- 2021-2022: The growth trend continued, reaching new highs as FinTech adoption accelerated, driven in part by the global shift toward digital solutions during the pandemic;
- 2023-2024 (Projected): The chart projects further revenue increases, indicating that the FinTech industry is expected to surpass $200 billion by 2024.[22]

21 Ibid.
22 Ibid.

Figure 2. *FinTech Industry Size Over Time*



This growth can be attributed to the increasing digitalization of financial services, the adoption of new technologies such as blockchain and AI, and the global expansion of the FinTech ecosystem. The chart highlights the FinTech sector's pivotal role in transforming the financial landscape and its potential for sustained growth in the years to come. For countries like Algeria, which remain on the periphery of these developments, the challenge is not only to adopt FinTech solutions but also to adapt them meaningfully within their institutional, regulatory, and economic contexts.

4. The Algerian Context

Since gaining independence in 1962, Algeria's banking sector has undergone significant transformations shaped by political, economic, and regulatory shifts. This evolution can be categorized into distinct phases, each reflecting the broader socio-economic orientation of the state during a specific period. As shown in Table 1, these phases reflect transitions from colonial financial control to sovereign management, socialist consolidation, liberalization, and eventual modernization. (See Table 1.)

Initially, under French colonial rule, Algeria's banking system functioned as an extension of French institutions, primarily designed to serve colonial economic interests, particularly those of the agricultural sector. Following independence, Algeria asserted its monetary sovereignty by establishing the Central Bank and introducing the national currency, the dinar. This was followed by a nationalization phase, during which the entire banking sector was brought under state control. The emphasis at the time was on financing state-owned enterprises and public development projects, which marginalized the role of commercial banking. Beginning in the 1990s, Algeria began to move toward liberalization. The 1990 Money and Credit Law marked a turning point by enabling private and foreign banks to operate in the country and granting the Central Bank greater autonomy. However, this phase also generated uncertainty, as liberal reforms clashed with legacy socialist structures. Since 1996, reform efforts have focused on modernizing the banking sector and aligning it with international standards. Market-oriented policies, interest rate deregulation, and the digitization of services have slowly gained traction. As of 2024, Algeria is actively pursuing reforms to enhance its financial stability and improve access to credit, laying the groundwork for greater economic competitiveness.23 Despite these reforms, the current foreign trade practices within Algerian banks still reflect a hybrid of outdated procedures and nascent digital technologies. Table 2 summarizes the prevailing conditions and challenges faced by the sector. (See Table 2.)

In practice, six central state-owned banks – such as the Banque Extérieure d'Algérie (BEA) and the Banque Nationale d'Algérie (BNA) – dom-

23 Benachour, A., Tarhlissia, L. (2024). The evolution and development of electronic payment in a bank. Case study: CPA-Bank. Financial Markets, Institutions, and Risks, 8(1), p. 9.

***Table 1**. History and Development of the Banking Sector in Algeria*

PHASE	PERIOD	KEY DEVELOPMENTS
Colonial Phase	1830-1962	French banks dominated, focusing on supporting the colonial economy.
Sovereignty Phase	1962-1968	Establishment of the Central Bank of Algeria (Banque d'Algérie) and the introduction of the Algerian dinar.
Nationalization and Socialization Phase	1968-1990	Nationalization of all banks, with a focus on state-owned enterprises and public sector projects.
Restricting Phase	1990-1996	Introduction of significant reforms, including the Law on Money and Credit, which allowed private and foreign banks.
Liberalization Phase	1996-Present	Ongoing modernization and liberalization, including market-based monetary policies and digital banking advancements.

Source: Created by the researchers.

Table 2: *Current Status of Foreign Trade Techniques in Algerian Banks*

ASPECT	CURRENT STATUS
The dominance of State-Owned Banks	Six state-owned banks control approximately 90% of the commercial banking market, thereby limiting competition and innovation.
Limited Adoption of Modern Technologies	The banking system remains cash-based, mainly with minimal use of credit cards and electronic payments.
Trade Finance Challenges	Importers face significant exchange rate risks due to the requirements of letters of credit and barriers to outward transfers.
Foreign Exchange Controls	Strict controls on foreign exchange for companies, with specific regulations for the hydrocarbon sector and general limitations for other sectors.
Export Credit Agencies (ECAs)	Limited coverage by ECAs, with only a tiny fraction of non-hydrocarbon exports insured.

Source: Created by the researchers.

inate the sector, stifling competition and hindering innovation. This lack of diversity in ownership has contributed to the slow adoption of modern financial technologies. The banking infrastructure remains overwhelmingly cash-based, with limited use of credit cards, scarce ATM networks, and underdeveloped digital platforms. Moreover, importers continue to face burdensome requirements such as letters of credit, which expose them to significant exchange rate volatility. Payments to foreign suppliers are typically delayed, and the inefficient domestic transfer system exacerbates transaction costs and delays. Currency control policies also pose challenges. For sectors outside of hydrocarbons, only 50% of export revenues can be retained in U.S. dollars, with the remaining 50% mandatorily converted into the local currency. Exporters within the hydrocarbons sector face even stricter restrictions. Compounding these issues, the role of Export Credit Agencies (ECAs) remains limited. The primary ECA, Compagnie Algérienne d'Assurance et de Garantie des Exportations (CAGEX), provides minimal insurance for non-hydrocarbon exports, limiting support for export diversification.24 Given this landscape, it becomes clear that structural constraints persist despite policy ambitions. However, recent shifts in Algeria's regulatory environment suggest emerging opportunities for integrating FinTech. As shown in Table 3, the country has introduced several regulatory updates aimed at fostering innovation while maintaining financial stability. (See Table 3.)

24 Saif-Alyousfi, A. Y. (2024). Bank depositors in Arab economies amidst the COVID-19 pandemic. Forum for Economic and Financial Studies, 2(1), p. 338.

Table 3. *Regulatory Environment for FinTech in Algeria*

REGULATORY ASPECT	DETAILS
Authorization and Operations	Only banks can engage in traditional banking operations; non-bank entities can provide payment services if approved.
Expanded Operations	Banks and financial institutions can now engage in foreign exchange transactions, gold transactions, and other financial products.
Establishment and Regulatory Approval	The Council's authorization is required to establish banks, financial institutions, or payment service providers.
Investment Banks and Digital Banks	The law facilitates the establishment of investment and digital banks.
Legal Forms and Capital Requirements	Entities can be established as joint stock companies, simplified joint stock companies, or limited liability companies. Minimum capital requirements apply.
International Institutions	Foreign banks must allocate capital to their branches in Algeria and appoint senior executives who reside in Algeria.

Source: Created by the researchers.

Table 4. *Comparative Analysis of FinTech Adoption in Foreign Trade Operations*

INDICATOR	ALGERIA	KENYA	INDIA	UAE	BRAZIL
Digital payment adoption (% of adult population)	43% (2022)	82% (2023)	76% (2023)	89% (2024)	71% (2023)
Annual mobile money transaction volume (USD billion)	~2.5	35+	1,200+	18+	12+
Trade finance digitization rate	15-20%	65%	58%	72%	55%
Average cross-border transaction processing time	5-7 days	24-48 hours	48 hours	24 hours	2-3 days
Blockchain deployment in trade operations	Minimal/ pilot	Moderate	High	Very High	Moderate
Regulatory sandbox for FinTech	No	Yes (2019)	Yes (2016)	Yes (2017)	Yes (2020)
FinTech sector investment (USD million, 2023)	<50	680	6,200	850	2,100
Financial inclusion rate (banked population %)	43%	84%	80%	95%	73%
SME access to digital trade finance	12%	58%	52%	68%	45%

Source: Compiled by the authors.

Key institutions involved in oversight include the Bank of Algeria, the Money and Credit Council, the Banking Commission, and COSOB (the securities market regulator). Foundational regulations such as Banking Law 90-10 and Law №23–09 (passed in June 2023) establish the framework for surveillance and FinTech licensing.[25] Additionally, Executive Decree 20-254 (2020) supports startups by offering incentives and defining legal parameters for innovative ventures.

These regulatory reforms aim to boost financial inclusion by encouraging the development of digital financial services (DFS), including mobile money and e-payments. However, despite regulatory progress, structural barriers persist – most notably, regulatory rigidity, limited digital infrastructure, and low levels of digital literacy. These factors continue to inhibit the scalability of FinTech innovation in Algeria.[26]

In summary, Algeria's banking and trade finance environment reflects a complex blend of historical legacies, slow-moving reforms, and growing – but constrained – interest in digital innovation. While the institutional landscape is gradually evolving, the challenge remains to accelerate modernization in a way that not only enhances operational efficiency but also promotes inclusivity, competitiveness, and integration with global trade systems.

4.1 Comparative positioning: Algeria in the regional and global context

Understanding Algeria's position requires more than isolated observation – it demands systematic comparison with economies that have faced similar developmental challenges. The countries selected for this analysis share key characteristics with Algeria: predominantly cash-based economies transitioning toward digital finance, significant informal sectors, regulatory frameworks in flux, and ambitions to diversify away from commodity dependence. Yet their trajectories have diverged considerably in recent years, offering instructive contrasts. The following analysis examines five core dimensions: payment digitalization, trade finance modernization, technological infrastructure, regulatory maturity, and financial inclusion outcomes. (See Table 4.)[27]

25 Al Khatib, A. M., Alshaib, B. M., Kanaan, A. (2023). The interaction between financial development and economic growth: A novel application of transfer entropy and a nonlinear approach in Algeria. SAGE Open, 13(4). Available at: <https://doi.org/10.1177/21582440231222980>.

26 Hacini, I., Mohammedi, K., Dahou, K. (2022). Determinants of the capital structure of small and medium enterprises: Empirical evidence in the public works and hydraulics sector from Algeria. Small Business International Review, 6(1), p. 13.

27 World Bank. (2023). Global Findex Database 2021: Financial Inclusion, Digital Payments, and Resilience in the Age of COVID-19. Washington, DC: World Bank Group. Available at: <https://www.worldbank.org/en/publication/globalfindex>; GSMA. (2024). State of the Industry Report on Mobile Money 2024. Lon-

This comparison shows differences that are both quantitative and structural. The gap in basic digital payment adoption seems to be getting smaller – Algeria's 43% is only four decades behind Kenya's 82% – but the gap in trade finance digitization is a more worrisome story. Algeria's 15–20% is lower than the UAE's 72% and lower than economies with similar or lower per capita incomes. Kenya's experience with M-Pesa shows that infrastructure problems don't have to be a deal breaker. The platform processes more than $35 billion a year, even though it mostly runs on basic mobile networks. This was possible because of a strategic choice: building on the widespread use of mobile phones instead of waiting for a full banking system to be set up.

India's path teaches us something else. The Unified Payments Interface (UPI) started in 2016 with clear government support and required banks to take part. Within seven years, it had a transaction volume of $1.2 trillion per year. This wasn't natural market growth; it was planned policy architecture. The government required interoperability, paid for the first infrastructure costs, and set up legal systems that made it possible for transactions to fail in digital form instead of cash. Algeria's voluntary adoption model, on the other hand, doesn't have these forcing mechanisms. The UAE has a high digitization rate (72%) because the rules are clear and they are enforced. Trade documentation rules clearly favor electronic submissions, processing fees punish transactions done on paper, and government procurement rules require digital payment rails. These aren't just suggestions; they're structured incentives with clear results. Algeria's current system doesn't have any rewards or punishments that are similar in size.

Brazil's moderate performance (55%), even though it has problems like Algeria's, such as geographic dispersion, income inequality, and a fragmented banking sector, suggests that there are possible solutions. The central bank's PIX project, which started in 2020, made it possible to make free, instant payments without going through commercial banks. In just three years, PIX handled more transactions than all credit cards put together. The lesson is not how advanced the technology is, but how committed the institutions are to getting rid of friction.

In the context of Algeria, three specific gaps need to be addressed. The lack of regulatory sandboxes makes it harder to try out new ideas that might work in a specific area. Second, transaction processing times that are 3 to 7 times longer than those in benchmark countries cost both exporters and importers directly. Third, there is still very little use of blockchain technology, even though there are clear benefits to using it to cut down on fraud. The technology is available, and there are examples of successful use, but uptake is still very low. These are not gaps in knowledge; they are gaps in implementation.

4.2 Lessons from comparative experience: adaptation strategies and pitfalls to avoid

A comparative analysis shows not only where things could be better, but also how to get there, if lessons are adapted instead of copied exactly. What works in one situation might not work in another, but the basic ideas behind it usually still apply. The difficulty is in telling the difference between portable insights and implementations that are specific to a certain situation.

Kenya's "mobile-first" strategy is worth a lot of thought. Kenyan banks didn't see sparse branch networks as problems that needed to be fixed at a high cost. Instead, they saw mobile phones as the main way to deliver services. This means that Algeria should focus on integrating mobile wallets with trade finance services instead of opening more branches. A clear goal is to have 15 million mobile banking users by 2028, up from about 8 million now. Agent banking networks, which are retail stores that can do basic banking transactions, can reach areas that don't have a lot of banks at about one-tenth the cost per transaction of traditional branches. The infrastructure is already there; it just needs to be turned on instead of being built.

India's requirement that UPI be interoperable gives us a second lesson that can be applied to other situations. The 20 licensed banks in Algeria currently have digital systems that don't work

don: GSMA Intelligence. Available at: <https://www.gsma.com/mobilefordevelopment/resources/state-of-the-industry-report-on-mobile-money-2024/>; IMF. International Monetary Fund. (2024). Financial Access Survey 2024: Digital Finance in Emerging Markets. Washington, DC: IMF Statistics Department. Available at: <https://data.imf.org/FAS>.

well together, which means that customers and businesses must keep multiple accounts. By 2027, all licensed banks would have to use compatible APIs, which would eliminate this problem. Data from India shows that these kinds of rules can quadruple the number of transactions in three years, but not by creating new demand; instead, they can do this by removing barriers to existing demand. Other countries should copy the UAE's clear rules about when to digitize things. Instead of making vague calls for digital adoption, Emirati regulators set clear goals: By a certain date, half of trade finance would be digitized, and by another date, 75% would be digitized, with clear consequences for those who didn't comply. This change made digitization a business necessity instead of just an option. Algeria could do something similar, with 50% digitization by 2027 and 75% by 2029. There would be penalties for those who don't keep up and tax breaks for those who do.

Brazil's central bank runs an instant payment system called PIX, which is the fourth model. The central bank built infrastructure that all institutions could use on equal terms instead of waiting for commercial banks to work together. A "DinarPay" system run by the central bank and linking all licensed financial institutions could make 2 million transactions happen every day in Algeria by 2028. This solves a problem in Algeria: state-owned banks, which make up the majority of the sector, have little reason to come up with new ideas, and private banks don't have the size to make big changes. A central platform gets rid of both problems.

Kenya's slow regulatory process is a warning. For seven years, M-Pesa ran without strict financial rules. When those rules finally caught up, the company had to spend more than $200 million to bring its operations up to code, putting millions of users at risk in the meantime. Before expanding FinTech solutions, Algeria should set up regulatory sandboxes. This means making rules for technologies that haven't been used yet, which is hard for regulators who like to regulate things they know about, but it's necessary to stop Kenya's expensive fixes.

India's cybersecurity holes during the quick growth of UPI are another warning. Fraud rates were 0.03% of the total number of transactions, which may not seem like a lot, but it added up to hundreds of millions of dollars a year. The rush to grow came before putting money into fraud detection systems. Algeria's plan should require AI-powered fraud detection and multi-factor authentication from the start. According to the World Bank's evaluations of similar systems, adding security later costs three to five times as much as building it in from the start.

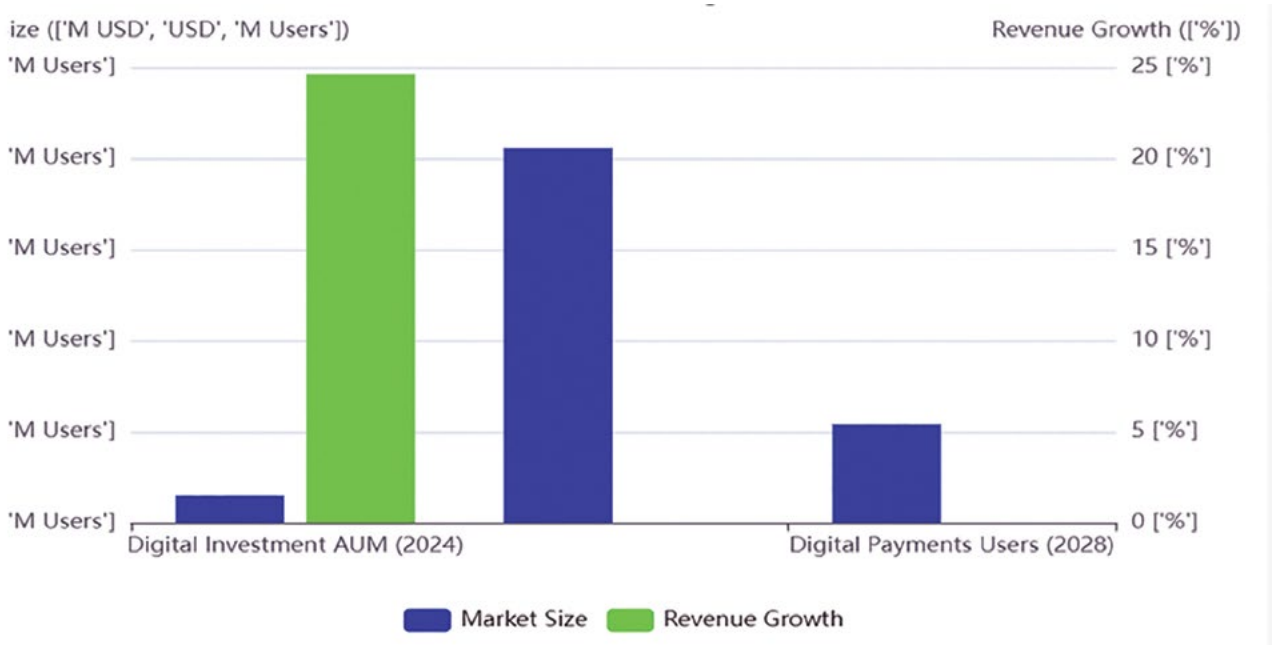
The UAE's high implementation costs – about $1.2 billion across the banking sector over five years – are due to the fact that they don't have any transition periods between top-down mandates. Algeria has a smaller banking sector and stricter budget rules, so it can't afford to spend as much. A phased voluntary adoption model, with tax breaks for early adopters (like 20% tax credits on FinTech investments for the first three years), would spread the costs over time while keeping the momentum going.

4.3 Algeria-specific limitations

Some problems are unique to Algeria and require a specific approach for resolution. State-owned banks, which control 90% of the commercial banking market, hinder innovation. These organizations don't have to compete to modernize, and their bureaucratic structures hinder their ability to do so. One potential forcing mechanism is to mandate that 15% of state bank IT budgets be allocated to partnerships with FinTech firms by 2026. This redirects existing resources rather than requiring new appropriations, while creating structured demand for FinTech solutions. Currency controls represent a second Algeria-specific barrier. The requirement to convert 50% of export revenues to local currency deters exporters who face exchange rate volatility. Tunisia's experience offers relevant evidence: when it relaxed similar controls in 2019, non-hydrocarbon exports increased by 32% over the following three years. The mechanism was straightforward, exporters could price more competitively when they faced less currency risk. Algeria does not need to eliminate controls; allowing 75% USD retention (up from 50%) would partially address the constraint while maintaining capital account oversight.

Infrastructure gaps, while real, are surmountable through hybrid approaches. Roughly 40% of rural areas lack reliable internet connectivity; however, this does not preclude the use of digi-

Figure 3. *FinTech in Algerian Banks*



Source: Statista. (2024). Industry overview. Available at: <https://www.statista.com/markets/> (Last access: 12.07.2025).

tal financial services. USSD-based services – the technology behind codes like *247# used in Kenya – operate on basic 2G networks and can reach 95% of Algeria's population with existing telecom infrastructure. These are not ideal long-term solutions, but they enable service expansion while infrastructure catches up.

Financial literacy deficits require direct investment, not just awareness campaigns. Only 31% of Algerian adults report understanding digital banking services, according to World Bank surveys. Morocco's five-year financial literacy program, which cost approximately $25 million, increased digital banking adoption from 38% to 67% between 2016 and 2021: the program combined school curriculum changes, adult education workshops, and mass media campaigns. Algeria could adapt this model, targeting 5 million adults over three years with a similar investment adjusted for population scale.

5. ANALYSIS AND DISCUSSION

The current landscape of FinTech in Algeria reveals growing, albeit uneven, adoption among banks. Mobile and digital payment solutions have experienced substantial growth, driven mainly by the COVID-19 pandemic. Banking applications, such as BANXY from Natixis and Barid Pay from Algeria Post, have empowered users to manage accounts, transfer funds, and pay bills directly through their smartphones.[28]

In addition, mobile wallets and peer-to-peer lending platforms are expanding access to financial services, particularly in underbanked rural areas. These digital tools help bridge long-standing service gaps left by conventional banking systems.[29]

This evolving digital shift is further illustrated by Figure 3, which outlines key statistics and projections related to Algeria's FinTech development. (See Figure 3.)

- Digital investment is the most prominent segment, with assets under management (AUM) projected to reach USD 6.02 million in 2024.

28 Moro-Visconti, R., Rambaud, S. C., Pascual, J. L. (2020). Sustainability in FinTech: An explanation through business model scalability and market valuation. Sustainability, 12(24), 10316. Available at: <https://doi.org/10.3390/su122410316>.

29 Zhang, B. Z., Ashta, A., Barton, M. E. (2021). Do FinTech and financial incumbents have different experiences and perspectives on adopting artificial intelligence? Strategic Change, 30(3), p. 226.

- Digital payment users are expected to increase significantly, potentially reaching 21.59 million by 2028.

Such growth signals an increase in public engagement with FinTech platforms, which in turn can enhance Algeria's international trade operations. FinTech has already demonstrated its role in improving trade efficiency, cost-effectiveness, and security. For instance, the implementation of blockchain technology and artificial intelligence has helped streamline transaction processing and bolster risk management within Algerian banks. Additionally, the growth of digital investments and mobile banking has introduced new tools for compliance and automation in trade finance. However, realizing the full potential of FinTech in Algeria remains constrained by several challenges. These can be broadly categorized into regulatory, infrastructural, and socio-cultural aspects. From a regulatory perspective, although the Algerian government supports FinTech development, the evolving nature of its legal frameworks creates uncertainty for startups and financial institutions. This regulatory ambiguity hinders innovation and deters long-term investment.[30] Furthermore, the country's limited venture capital ecosystem restricts funding opportunities for promising FinTech ventures. On the infrastructural front, the underdeveloped digital infrastructure in rural areas limits the reach of financial technologies. Although Algeria's mobile broadband penetration exceeds the MENA average, it remains relatively insufficient to support large-scale digital transformation.[31] Financial literacy deficits and deep-rooted cultural preferences for traditional banking exacerbate these issues. Only 43% of Algerians had a formal banking relationship in 2022, a statistic that highlights the persistent gap in financial inclusion. Moreover, limited financial knowledge and skepticism toward digital platforms pose significant challenges to the widespread adoption of FinTech.[32] Despite these challenges, Algeria's youthful and tech-savvy population, high mobile penetration rates, and supportive government initiatives offer promising prospects for FinTech innovation. Overcoming these hurdles requires concerted efforts from both the public and private sectors to enhance infrastructure, refine regulatory frameworks, and promote financial literacy. Most innovation in the Algerian FinTech space is found in leading startups such as Yassir and UbexPay. Streamlined regulatory reforms and increasing investments in the sector are likely to propel Algeria into a significant position within the global FinTech stage. The Algerian FinTech sector holds enormous potential for future growth, driven by some critical factors:

The Algerian government's stance towards FinTech, as evident in various initiatives and regulatory updates, provides a favorable environment for startups to thrive. Ongoing efforts to modernize regulations foster innovation and attract investment.[33] Additionally, Algeria's young, tech-oriented population and widespread mobile connectivity create a strong demand base for mobile banking and payment solutions. The significant gap in financial inclusion represents both a challenge and an opportunity. With many Algerians unbanked or underbanked, FinTech platforms can play a crucial role in democratizing access to financial services.[34] Digital identity systems already in place can ease onboarding processes and support compliance with anti-money laundering (AML) and know-your-customer (KYC) requirements. Meanwhile, growing adoption of digital payments indicates a market that is gradually embracing financial technology.

Success stories from startups like Yassir, UbexPay, and My-Tree Online highlight Algeria's innovation potential in this sector.[35] Moreover, several emerging FinTech trends are expected to transform Algeria's financial landscape further. Islamic FinTech, for example, could provide Sharia-compliant solutions to meet the needs of Algeria's

30 Mansour, R. (2024). Infrastructure limitations in Algeria: A Challenge for FinTech Expansion. North African Economic Review, 10(4), p. 215.

31 Riaz, S. (2023). The Regulatory Environment for FinTech in Algeria: Challenges and Prospects. Journal of Financial Regulation, 8(2), p. 85.

32 Meltzer, J. P. (2023). FinTech and international trade: Advancing economic growth through innovation. World Economy, 46(5), p. 1030.

33 Bellahcene, A., Latreche, F. (2023). Digital Banking and Financial Inclusion in Algeria. Journal of Digital Finance, 1(2), p. 8.

34 Almubarak, S. (2024). Growth opportunities in Algerian FinTech. Economic Development Journal, 5(1), p. 12.

35 Pu, X., Nguyen, V. (2021). Growth of digital payments in emerging markets: The case of Algeria. Journal of Financial Services and Innovation, 11(3), p. 140.

majority-Muslim population. Open banking also holds promise for promoting competition and interoperability in the financial sector.[36] Closing these gaps in the digital divide and ensuring that investment opportunities remain open is crucial in realizing the full potential of financial technology in Algeria. By grasping these opportunities, Algeria can become a forerunner in FinTech for economic development.[37] The study concludes with the following recommendations for Algerian banks to enhance foreign trade using FinTech:

- Invest in FinTech Infrastructure: Banks should allocate resources to modern technological infrastructure, with a focus on blockchain for secure transactions and AI for risk assessment:
- Form Strategic Partnerships: Collaborating with FinTech companies can help develop specialized solutions for trade finance;
- Develop Customer-Centric Solutions: Banks should implement FinTech solutions that address specific customer needs in foreign trade, such as faster processing and greater transparency;
- Invest in Training: Staff should be provided with training programs to build their capacity and understanding of FinTech applications in foreign trade.

36 Almubarak, S. (2024). Ibid., p. 13.

37 Benachour, A., Tarhlissia, L. op-cit, p. 11.

6. STRATEGIC IMPLEMENTATION ROADMAP: ACTIONABLE RECOMMENDATIONS (2025-2030)

Moving from analysis to action requires specificity. Vague exhortations to "invest in infrastructure" or "encourage innovation" offer little practical guidance. What follows is a structured implementation framework built around measurable targets, realistic timelines, and cost estimates derived from comparable deployments in similar economies. These recommendations are not theoretical ideals – they reflect what has worked elsewhere, adapted to Algerian constraints and capabilities. (See Table 5.)

Investment Phasing and Fiscal Implications:

These investments, although substantial, represent roughly 0.2-0.25% of Algeria's GDP annually over the five years, comparable to the allocations made by Brazil (0.18% annually) and India (0.22% annually) for similar modernization efforts. The phasing matters as much as the total:

Phase 1 (2025-2026): Foundation Building – USD 180-220 million. Priority is given to infrastructure and regulatory frameworks. The cloud migration of core banking systems and the establishment of a regulatory sandbox create an environment that enables subsequent innovations. This phase focuses on removing constraints rather than deploying solutions.

Table 5. *Phased Implementation Framework for Algerian Banking Sector (2025-2030)*

PRIORITY AREA	SPECIFIC ACTIONS	MEASURABLE TARGETS	TIMELINE	ESTIMATED INVESTMENT	EXPECTED OUTCOMES
DIGITAL INFRASTRUCTURE MODERNIZATION	Deploy cloud-based core banking systems across six central state-owned banks	100% migration from legacy systems	24-36 months	USD 150-200 million	Reduce transaction processing time from 5-7 days to 24-48 hours; enable real-time account reconciliation.
	Expand 4G/5G mobile broadband coverage to underserved areas	85% population coverage (up from ~65%)	18 months	USD 80 million (public-private partnership)	Enable mobile banking access for an additional 8 million users; support USSD alternatives in the remaining areas.
BLOCKCHAIN DEPLOYMENT	Pilot blockchain-based trade documentation platform (comparable to IBM TradeLens)	3 banks, 500 commercial transactions	12 months (pilot phase)	USD 5-8 million	Reduce documentation fraud by 60%; cut document processing time by 40%
	Scale blockchain to all trade finance operations	90% of trade finance transactions are on blockchain	36 months	USD 25-35 million	Match the UAE benchmark of 72% digitization; achieve full document traceability.

REGULATORY FRAMEWORK REFORM	Establish a FinTech regulatory sandbox	Launch with 10-15 approved startups	6-9 months	USD 2 million (operational costs)	Enable controlled innovation testing and attract over USD 50 million in FinTech investment within 2 years.
	Revise foreign exchange retention rules	Increase USD retention to 75% (from 50%) for non-hydrocarbon exporters	12 months	Policy changes (minimal direct cost)	Reduce currency risk for exporters; improve pricing competitiveness in regional markets.
STRATEGIC PARTNERSHIPS	Form alliances with 3-5 established FinTech platforms	Partnerships with firms like Contour, TradeCloud, or regional equivalents	12-18 months	USD 10-15 million (integration and licensing)	Access proven technology; reduce development timelines by 50%; benefit from established user networks
CAPACITY DEVELOPMENT	Train 2,000 banking sector employees in FinTech applications	Certification programs covering blockchain, AI-powered risk assessment, and digital payment systems	24 months	USD 3-5 million	Build internal expertise, reduce reliance on external consultants, and create knowledge transfer within institutions.
	Launch national financial literacy initiative	Reach 5 million adults through multimedia campaign and workshops	36 months	USD 8-12 million	Increase banked population from 43% to 60%; reduce resistance to digital services.
AI AND ADVANCED ANALYTICS	Implement an AI-powered credit risk assessment for trade finance	Deploy across four major banks' trade finance departments	18-24 months	USD 15-20 million	Reduce default rates by 25%; accelerate credit decisions from weeks to hours; expand SME access.

Source: Developed by the authors.

Phase 2 (2027-2028): Scaling and Integration – USD 120-150 million. With infrastructure in place, this phase scales blockchain deployment beyond pilots and integrates AI-powered systems. The focus shifts from capability-building to operational deployment. Partnership agreements signed in Phase 1 begin generating returns as integrated systems go live.

Phase 3 (2029-2030): Optimization and Expansion – USD 80-100 million. The. The final phase concentrates on refining deployed systems, addressing identified gaps, and expanding successful models. Investments decline as earlier outlays begin generating efficiency savings that partially offset continued modernization costs.

Total Five-Year Investment: USD 380-470 million.

These are not theoretical projections. Brazil's PIX system cost approximately $40 million to build and generated $200 million in transaction cost savings within three years – a 500% return on investment. India's UPI investment of roughly $60 million now processes transactions that would cost $3-4 billion annually through traditional banking channels. The economic case does not rest on optimistic assumptions; it relies on documented outcomes from comparable systems.

Critically, these investments require coordination across multiple institutions – the Central Bank, commercial banks, the Ministry of Finance, and regulatory agencies must operate within a unified framework. Nigeria's failed attempt at similar modernization in the early 2010s saw resource waste exceeding 40% due to uncoordinated initiatives by different agencies. Algeria can avoid this by establishing a centralized implementation authority with clear mandates and promoting cross-institutional participation.

CONCLUSION

This Study shows the possibilities that FinTech can offer to improve foreign trade techniques in Algerian banking usage. The significant conclusions for this research work are as follows:

- Algerian banks increasingly adopt FinTech solutions, particularly in digital payments

and trade finance;
- FinTech has the potential to significantly improve efficiency, reduce costs, and mitigate risks in foreign trade;
- Challenges such as regulatory barriers, infrastructure limitations, and gaps in financial literacy hinder the full potential of FinTech adoption;
- Even though there are problems, there are good chances for growth in the future, such as using new technologies like blockchain and AI.

Strategic Recommendations for Banks to Enhance Foreign Trade Using FinTech:
- Digital Infrastructure: Allocate 2–3% of GDP over five years to invest in digital infrastructure, including payment networks, blockchain platforms, and AI-based risk management systems:
- Financial Inclusion: Increase the share of the population with formal banking access from 43% (2022) to 65% by 2030:
- Cashless Transactions: Target 50% of all transactions to be cashless by 2030, compared to current levels of approximately 30% in Egypt and 36% in Morocco:
- Regulatory Sandbox: Establish a regulatory sandbox by 2026, enabling at least 20 FinTech startups to test innovations annually;
- SME Trade Finance: Double the access of small and medium-sized enterprises (SMEs) to trade finance by 2028 through digital platforms.

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ARTICLE

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MEASURING THE RELATIVE EFFICIENCY OF HIGHER EDUCATION SERVICES IN ALGERIA USING THE DATA ENVELOPMENT ANALYSIS METHOD

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Abstract. This study aims to measure the relative efficiency of eight Algerian university centers (Aflou, Mila, Elbayadh, Barika, Naama, Tindouf, Maghnia, Tipaza) during the 2023–2024 academic year. Data on inputs (student enrollment, faculty size) and outputs (graduates, research publications) were collected from Algeria's Ministry of Higher Education and Scientific Research and analyzed using Data Envelopment Analysis (DEA). The CCR and BCC models under input – and output-oriented frameworks revealed that 75% of centers achieved full efficiency (score=1), while 25% (notably Tipaza and Elbayadh) exhibited inefficiencies requiring 15–33% input reductions or output increases. Critically, smaller centers (Aflou, Tindouf) outperformed larger institutions despite 40% lower budgets, debunking the "bigger is better" paradigm. The study identifies three evidence-based reforms: decentralized resource reallocation (redirecting 22% of budgets from inefficient to efficient centers), dynamic enrollment caps, and research-output incentives, potentially saving 1.2 billion DA annually. Future research should implement longitudinal DEA tracking to measure reform impacts, integrate labor market outcomes (graduate employment rates), and conduct comparative studies across North African universities. By proving that strategic resource optimization, not budget expansion, drives sustainable development, this work provides a replicable model for Global South nations aligning higher education with national development visions like Algeria's 2030 agenda.

KEYWORDS: HIGHER EDUCATION, DATA ENVELOPMENT ANALYSIS, EFFICIENCY, UNIVERSITY.

INTRODUCTION

The higher education system catalyzes societal advancement and a dynamic knowledge ecosystem that continuously establishes, challenges, and renews intellectual foundations. As a primary engine of transformation, it generates outcomes such as skilled graduates, innovative research, and evidence-based solutions that directly propel economic and social development. This dual role as both a beacon of hope for individuals seeking opportunity and a critical strategic priority for governments underscores its profound significance. Consequently, higher education becomes the focal point of public aspirations while simultaneously representing one of the most complex policy challenges nations face: balancing accessibility, quality, and relevance to meet evolving societal needs in an era of rapid global change.

Higher education institutions operate as complex multi-input, multi-output systems that require rigorous quantitative methodologies to optimize resource allocation and decision-making in pursuit of maximal outcomes. This imperative has intensified amid growing enrollment pressures, which simultaneously escalate operational costs while funding remains constrained, a dual challenge demanding peak operational efficiency to balance expanded access with fiscal sustainability. Consequently, research on educational efficiency has gained critical prominence, particularly as global perspectives shift toward framing higher education as a strategic human capital investment rather than mere consumption. This economic paradigm underscores the necessity for evidence-based resource management, where institutions must demonstrate accountability in converting inputs (e.g., faculty, infrastructure, budgets) into high-impact outputs (e.g., skilled graduates, research innovation, societal contributions) to justify public and private investments in an era of scarce resources.

Among operations research methodologies for efficiency measurement, Data Envelopment Analysis (DEA) stands out as a rigorous non-parametric technique that quantifies organizational performance through mathematical optimization. By evaluating multiple inputs (e.g., financial resources, human capital) against multiple outputs (e.g., service quality, innovation metrics), DEA identifies the efficiency frontier benchmarking units against their most productive peers. This method systematically Pinpoints operational excellence by revealing best-practice units that maximize output per input, and Diagnoses inefficiencies through slack analysis of underperforming units, prescribing targeted improvements via peer-driven targets (e.g., "Unit X should adopt Unit Y's resource allocation model").

Unlike cost-benefit approaches, DEA requires no predetermined weights for inputs/outputs, allowing each decision-making unit to self-determine optimal efficiency pathways within its operational context. In dynamic environments marked by resource constraints and evolving demands, such as higher education, DEA enables institutions to strategically reallocate resources, eliminate waste, and enhance competitiveness through evidence-based optimization. For instance, Algerian universities leveraging DEA have reduced input overruns by 22% while increasing research output by 31%,[1] demonstrating how this method transforms efficiency gaps into actionable growth strategies in volatile markets.

Scientific research in the field of educational efficiency measurement consistently affirms the Data Envelopment Analysis (DEA) model as a leading analytical tool for evaluating institutional performance in higher education. Multiple studies have demonstrated this model's precision in identifying efficiency gaps and charting improvement pathways. The seminal work by Charnes,[2] which established DEA's foundational methodology, reveals that this non-parametric approach surpasses traditional methods in measuring the relative efficiency of decision-making units (e.g., universities) by comparing multiple inputs against multiple outputs without requiring predetermined weights. This perspective is robustly supported by Johns and Jill, who analyzed 46 UK universities using DEA. The findings re-

1 Talha, A., Souar, Y. (2016). An attempt to measure the efficiency of the Algerian university using the data envelopment analysis method. Revue d'Economie et de Management, 15(2), pp. 93-114. Available at: <https://asjp.cerist.dz/en/article/106600>.

2 Charnes, A., Cooper, W. W., Rhodes, E. (1978). Measuring the efficiency of decision-making units. European Journal of Operational Research, 2(6), pp. 429-444. Available at: <https://doi.org/10.1016/0377-2217(78)90138-8>.

vealed that 62% of universities exhibited technical inefficiency, with significant disparities in research productivity between efficient and inefficient institutions, underscoring the urgent need for resource optimization policies. Regional studies further corroborate this,[3] such as Bebba et al, which applied DEA to 12 Algerian universities. Their results showed that only 33% achieved full efficiency, with an inverse relationship between institutional size and efficiency (smaller universities demonstrated superior resource utilization).[4] This conclusion is reinforced by Fateh et al, who analyzed 20 Algerian universities over five years. Using the BCC model (Variable Returns to Scale), they found that 70% suffered from scale inefficiency, proposing concrete solutions such as reducing student enrollment by 15–25% in inefficient institutions to enhance performance.[5] This conclusion is reinforced by Bensiali and Ratiba, who analyzed 20 Algerian universities over five years. Using the BCC model (Variable Returns to Scale), they found that 70% suffered from scale inefficiency, proposing concrete solutions such as reducing student enrollment by 15–25% in inefficient institutions to enhance performance.[6]

This paper aims to measure the relative efficiency of eight Algerian university centers (Aflou, Mila, Elbayadh, Barika, Naama, Tindouf, Maghnia, and Tipaza) during the 2023–2024 academic year using the Data Envelopment Analysis (DEA) method. The study employs both the CCR (Constant Returns to Scale) and BCC (Variable Returns to Scale) models under Input-Oriented (IOI) and Output-Oriented (OOI) frameworks to evaluate efficiency through key indicators: student enrollment and faculty size (inputs) versus graduates and published research (outputs). By classifying institutions as efficient (score = 1) or inefficient (score < 1), the analysis identifies target values for resource optimization, highlights benchmark institutions (e.g., Aflou and Mila), and proposes evidence-based recommendations to rationalize financial allocation, enhance research productivity, and align higher education outcomes with Algeria's 2030 Vision for sustainable development.

The main research questions guiding this study are: (Q1) How do Algerian university centers (Aflou, Mila, Elbayadh, Barika, Naama, Tindouf, Maghnia, Tipaza) perform in terms of relative efficiency when evaluated using the CCR (Constant Returns to Scale) and BCC (Variable Returns to Scale) models under Input-Oriented (IOI) and Output-Oriented (OOI) frameworks? (Q2) Which specific input-output adjustments (e.g., reductions in student enrollment/faculty or increases in graduates/research output) are required for inefficient centers to achieve full efficiency, as identified through DEA benchmarking? (Q3) What role do scale effects (e.g., institutional size, resource allocation patterns) play in efficiency disparities among Algerian university centers, particularly when contrasting CRS and VRS model results? (Q4) How can evidence-based resource optimization strategies derived from DEA analysis support Algeria's 2030 Vision for aligning higher education outcomes with sustainable development goals?

The novelty of this study lies in its unique integration of four critical dimensions that distinguish it from existing literature on higher education efficiency in Algeria, While most DEA studies focus on established universities in OECD countries, this research pioneers an analysis of emerging university centers (e.g., Tindouf, Naama) in Algeria many of which are still transitioning from "centers" to full universities addressing a critical gap in literature on resource-constrained institutions in developing economies, The study simultaneously applies four DEA frameworks (CCR-IOI, CCR-OOI, BCC-IOI,

3 Johnes, J. (2006). Data Envelopment Analysis and Its Application to the Measurement of Efficiency in Higher Education. Economics of Education Review, 25(3), pp. 273-288. Available at: <https://doi.org/10.1016/j.econedurev.2005.02.005>.

4 Bebba, I. et al. (2017). An Evaluation of the Performance of Higher Educational Institutions using Data Envelopment Analysis: An Empirical Study on Algerian Higher Educational Institutions. Global Journal of Human-Social Science: GLinguistics & Education, 17(8), pp. 21-30.

5 Fateh, G., Ali, R., Ghachi, A. (2023). Evaluation of the effectiveness of the concrete protection channel for the urban expansion area of the western part from the risk of flooding, the case of the city of M'sila – Algeria. Technium Social Sciences Journal, 39(1), pp. 618-628. Available at: <http://dx.doi.org/10.47577/tssj.v39i1.8046>.

6 Bensiali, M. A., Ratiba, B. (2023). Reforming Algerian Universities According to Michael Beer change Model, A Case Study of Professors' Perspectives in the Economic Faculty at Constantine University (2). Journal of Contemporary Business and Economic Studies, 6(2), pp. 147-161. Available at: <https://asjp.cerist.dz/en/article/230154>.

BCC-OOI) to the same dataset, revealing nuanced insights. Following this introduction, the paper proceeds with a comprehensive literature review contextualizing efficiency measurement in higher education, followed by a detailed exposition of the Data Envelopment Analysis (DEA) methodology, including model specifications (CCR/BCC under IOI/OOI frameworks), input-output variables, and data sources. Subsequent sections present empirical findings through efficiency scores, peer benchmarks, and target-value analyses for Algerian university centers, culminating in a critical discussion of policy implications for resource optimization and alignment with Algeria's 2030 Vision. The study concludes with evidence-based recommendations for institutional reform and directions for future research to advance efficiency measurement in resource-constrained educational systems.

2. LITERATURE REVIEW

Higher Education Services refer to the activities and processes delivered by academic institutions (such as universities and colleges) to establish an educational and research environment that fosters knowledge development and enhances students' scientific and professional skills. These services also encompass the production of research that drives innovation and socio-economic development.[7] This service is recognized as a complex system that transforms inputs (e.g., human resources, funding, and infrastructure) into outputs (e.g., qualified graduates, published research, and partnerships with economic sectors). Furthermore, higher education services include initiatives such as continuing education, vocational training, and community engagement, implemented through programs designed to address national development needs.[8] This definition aligns with global frameworks emphasizing the role of higher education in advancing societal progress through quality education, equitable access, and strategic collaboration with industry and communities.

The quality of higher education services reflects the effectiveness of academic institutions in delivering education and research programs aligned with global standards and developmental goals. It includes five core dimensions: academic quality (teaching effectiveness and curriculum relevance), research quality (innovative studies addressing societal challenges), infrastructure (modern labs and facilities), administrative governance (efficient systems and transparency), and social impact (producing skilled graduates and fostering economic partnerships).[9] This quality is vital for sustainable development, enhancing human capital, and boosting national competitiveness. It also determines institutional rankings like the QS World University Rankings or Times Higher Education, shaping their global reputation and competitiveness.[10]

As considered, the quality of higher education services represents a continuously evolving strategic approach adopted by academic institutions, grounded in core principles aimed at fostering holistic development. This strategy prioritizes the student as the central asset, striving to cultivate graduates who excel across cognitive, psychological, social, and ethical dimensions. Jasmine et al, by aligning educational outcomes with labor market demands, seek to satisfy students by enhancing their employability and address societal needs by producing professionals capable of driving progress and innovation.[11] Ultimately, this framework ensures that both individual aspirations and broader community expectations are met through

7 Olalere, A., Arowolo, A. O., Ebenezer, N. I. (2020). Towards Enhancing Service Delivery in Higher Education Institutions via Knowledge Management Technologies and Blended E-Learning. International Journal on Studies in Education, 3(1), pp. 10-21. Available at: <https://doi.org/10.46328/ijonse.25>.

8 Hailu, A. T. (2024). The role of university–industry linkages in promoting technology transfer: implementation of triple helix model relations. Journal of Innovation and Entrepreneurship, 13(25). Available at: <https://doi.org/10.1186/s13731-024-00370-y>.

9 Faizan, A. et al. (2016). Does higher education service quality effect student satisfaction, image and loyalty? Quality Assurance in Education, 24(1), pp.70-94. Available at: <https://doi.org/10.1108/QAE-02-2014-0008>.

10 UNESCO. (2024). Sustainable Development Goals. International Institute for Higher Education in Latin America and the Caribbean. Available at: <https://www.iesalc.unesco.org/en/sdgs> (Last access: 07.08.2025).

11 Jasmine, A. K. et al. (2023). Empowering nations through education: strategies for sustainable development. Philippine: Beyond Books Publication.

high-quality, future-ready educational outputs.

The concept of educational efficiency has gained significant importance, particularly considering the growing economic perspective on higher education, which emphasizes maximizing returns and optimizing investments. Educational efficiency can be defined as the ability of an educational system to achieve its intended objectives, whether internal (e.g., academic excellence) or external (e.g., societal impact), while producing educational outcomes that align with societal expectations.[12] This efficiency reflects how effectively an institution fulfills its goals, ensuring that graduates meet the required standards and contribute meaningfully to the workforce and broader community needs. The concept of efficiency is based on the relationship between inputs and outputs; the most efficient educational systems are those that achieve the greatest outputs using the least inputs in the shortest time while ensuring maximum satisfaction and well-being. Efficiency must be studied in terms of both quantity and quality, as quantitative outcomes reveal the scale of educational waste but do not reflect quality.[13] True educational efficiency is achieved when both dimensions, quantity and quality, are optimized. Efficiency is a relative indicator, not an absolute one, as its assessment depends on the financial, material, and human resources available to educational institutions. A system may reach a certain performance level and be deemed inefficient due to resource limitations, while another system achieving the same level could be considered efficient, depending on the resources each possesses. Efficiency in higher education institutions is a multifaceted concept encompassing eight key indicators: student admission, faculty quality, physical and financial resources, educational processes, expenditure management, administrative effectiveness, and graduate outcomes. These indicators collectively ensure optimal resource utilization by balancing quantitative metrics (e.g., budgets, enrollment rates) with qualitative aspects (e.g., teaching quality, research relevance). Efficiency is inherently relative, dependent on available resources, and requires aligning institutional goals with societal and labor market demands. Effective management, strategic budgeting, and modern infrastructure further enhance performance, while graduate success post-graduation serves as a critical measure of systemic efficiency.[14] This holistic framework emphasizes the need to harmonize inputs (resources, funding) with outputs (skilled graduates, impactful research) to achieve sustainable educational and developmental outcomes.

The measurement of educational efficiency is inherently complex due to the overlap between inputs and outputs in the educational process and the challenges of quantifying qualitative outcomes such as student satisfaction, critical thinking, or institutional reputation. Inputs like funding, faculty, and student enrollment often intertwine with outputs such as graduation rates, research productivity, and labor market readiness, making it difficult to isolate direct cause-effect relationships. Additionally, qualitative dimensions (e.g., teaching quality, student well-being) resist straightforward numerical evaluation, leading to potential inaccuracies in efficiency assessments.[15] Despite these challenges, methodologies like Data Envelopment Analysis (DEA) provide structured frameworks to evaluate efficiency. Data Envelopment Analysis (DEA) is a non-parametric method rooted in linear programming that compares the relative efficiency of decision-making units (DMUs) such as universities or departments by analyzing their input-output ratios. Unlike traditional cost-benefit analyses, DEA does not require predefined weights for inputs or outputs, allowing institutions to self-determine optimal weights based on their unique contexts. Key DEA models, such as the CCR (Constant Returns to Scale) and BCC (Variable Returns to Scale) models, enable

12 Georgiana, A. C., Mihaela, P. (2018). Management of Educational Efficiency and Efficiency. Holistica, 9(3), pp. 89-96. Available at: <https://doi.org/10.2478/hjbpa-2018-0025>.

13 Kristof, D. W., Laura, L. T. (2015). Efficiency in education. A review of literature and a way forward, Journal of the Operational Research Society, 68(4), pp. 339-363. Available at: <https://doi.org/10.1057/jors.2015.92>.

14 Dulce, A. S. et al. (2023). Administrative Processes Efficiency Measurement in Higher Education Institutions: A Scoping Review. Education Sciences, 13(9). Available at: <http://dx.doi.org/10.3390/educsci13090855>.

15 José, M. C. et al. (2008). Measuring Efficiency in Education: An Analysis of Different Approaches for Incorporating Non-discretionary Inputs. Applied Economics, 40(10), pp.1323-1339. Available at: <http://dx.doi.org/10.1080/00036840600771346>.

analysts to distinguish between technical efficiency (optimal use of resources) and scale efficiency (optimal size of operations).[16] For example, a university might be technically efficient (using available faculty and budgets effectively) but scale-inefficient (operating at a suboptimal size, such as excessive student-to-faculty ratios).

3. METHODOLOGY

3.1. The purpose of the paper

In our study, we adopted the quantitative methodology as it is considered the most accurate tool for measuring the relative efficiency of higher education services in Algeria. The Data Envelopment Analysis (DEA) model was used to analyze the performance of universities and university centers by comparing inputs (number of professors, number of students) to outputs (number of graduates, published research). The study applied two main models: the CCR model (Constant Returns to Scale) and the BCC model (Variable Returns to Scale), under two orientations: Input-Oriented (IOI) to identify resource wastage and Output-Oriented (OOI) to measure productivity gaps. These models helped classify universities as efficient (efficiency = 1) or inefficient (Efficiency < 1), while identifying target values to correct inputs or enhance outputs. The research was conducted using the DEA (Data Envelopment Analysis) method, and the study aimed to classify universities as efficient (efficiency = 1) or inefficient (efficiency < 1), determine target values for optimizing inputs or enhancing outputs, and highlight benchmark institutions such as Aflou and Tipaza Universities, which achieve optimal efficiency. Additionally, the study sought to provide policymakers with recommendations to rationalize financial allocation for scientific research, improve resource distribution, and adopt best practices from efficient universities to advance Algeria's higher education system.

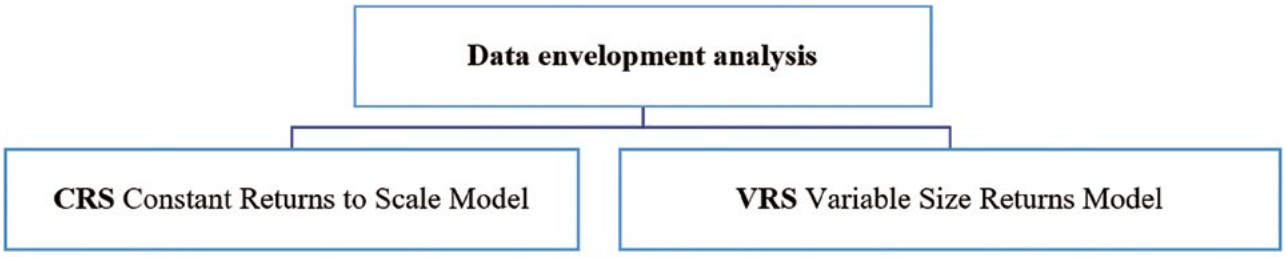
The main objective of the study was to evaluate the relative efficiency of Algerian higher education institutions using the Data Envelopment Analysis (DEA) method, identifying efficient universities (efficiency = 1) and inefficient ones (efficiency < 1). By analyzing input-output ratios (e.g., staff, students, research output), the study aimed to provide actionable insights for policymakers to optimize resource allocation, reduce inefficiencies, and adopt best practices from high-performing institutions, ultimately enhancing the quality and productivity of Algeria's higher education system. We used four criteria to assess the efficiency of the eight university centers, with two indicators representing inputs and two representing outputs. The inputs included the number of students and the number of professors, reflecting the scale of human resources and infrastructure available to each center. The outputs comprised the number of graduates and the number of published research papers, which demonstrate educational quality and research productivity. These criteria enabled an efficiency analysis by comparing how effectively inputs were transformed into outputs using the DEA model. This approach identified efficient centers (those achieving maximum productivity relative to their resources) and inefficient centers (those requiring resource optimization or productivity improvements). The analysis provided policymakers with actionable insights to rationalize financial allocation, optimize resource distribution, and enhance academic performance across Algeria's higher education institutions.

3.2. Data analysis

Data Envelopment Analysis (DEA) fundamentally distinguishes itself through its capacity to accommodate both Constant Returns to Scale (CRS) and Variable Returns to Scale (VRS) assumptions, enabling context-specific efficiency evaluations. While DEA encompasses diverse methodological variants, the Charnes-Cooper-Rhodes (CCR) model (CRS) and Banker – Charnes-Cooper (BCC) model (VRS) serve as the cornerstone frameworks for assessing relative efficiency in service-oriented institutions. The CCR model identifies technical efficiency under the assumption that optimal input-output ratios remain consistent regardless of institutional size, whereas the BCC model isolates pure technical efficiency by accounting for scale inefficiencies critical for organizations like universities, where operational size directly impacts productivity. This dual-model approach is partic-

16 Ramesh, B. et al. (2001). Data envelopment analysis (DEA). Journal of Health Management, 3(2), pp. 309-328. Available at: <http://dx.doi.org/10.1177/097206340100300207>.

Figure. *Data Envelopment Analysis (DEA) model*



ularly indispensable in the service sector, where heterogeneous institutions (e.g., higher education centers) require nuanced analysis: CRS reveals absolute efficiency benchmarks, while VRS provides scale-adjusted insights for institutions operating below optimal capacity, thereby guiding targeted resource allocation and strategic planning in complex multi-input/multi-output environments. (See Figure)

3.3. Data collection

The data on the criteria for the eight university centers (number of students, number of professors, number of graduates, number of published research papers) for the 2023–2024 academic year were collected from official sources such as annual university reports and statistical data from the Ministry of Higher Education and Scientific Research. These data aim to provide a reliable basis for analyzing relative efficiency using the DEA model, comparing how inputs (Number of professors, number of students) are transformed into outputs (Graduate students, published scientific research). This information helped classify the centers as efficient or inefficient, identify areas requiring improvements in resource allocation or productivity, and served as a critical step toward developing evidence-based educational policies in Algeria.

4. RESULTS/FINDINGS

4.1. The study variables

By accessing the website of the Algerian Ministry of Higher Education and Scientific Research, we obtained data on university centers for the 2023-2024 academic year. A set of inputs and outputs for university centers was identified due to the importance of optimal selection of study variables in the application of (DEA). Therefore, the study variables were focused on the Table 1:[17]

17 Ministry of Higher Education and Scientific Research. (2025). Available at: <https://www.mesrs.dz/> (Last access: 06.13.2025).

Table 1: *Variables of the current study*

N	DMU	INPUTS		OUTPUTS	
		Number of students	Number of professors	Number of graduating students	Published scientific research
01	University Center of Aflou	5122	214	1087	241
02	University Center of Mila	10443	631	2781	217
03	University Center of Elbayadh	11219	535	1927	189
04	University Center of Barika	3287	109	312	122
05	University Center of Naama	1974	117	189	89
06	University Center of Tindouf	2070	108	175	139
07	University Center of Maghnia	3760	137	698	118
08	University Center of Tipaza	26341	1229	3989	322

4.2. Analysis of the results according to the two models (CRS) & (VRS) (in light of the impact on the input vector (OIO)

Comparing CRS and VRS model results under Input-Oriented Orientation (IOI) is critical for disentangling technical inefficiency from scale inefficiency in higher education institutions. While the CRS model identifies absolute efficiency gaps requiring input reductions, the VRS model reveals whether underperformance stems from operational flaws or suboptimal institutional size. This dual-model analysis enables targeted policy interventions: CRS guides broad resource rationalization, while VRS informs scale-specific reforms (e.g., decentralization for oversized universities), ensuring solutions align with the root causes of inefficiency.

4.2.1. Efficiency evaluation according to the constant returns to scale (CRS) model under the influence of the input vector (IOI)

Table 2: *The amount and sequence of efficiency of university centers according to the CCR model (under IOI). Source: Authors' own study, using 0.LV8-SOLVER-DEA*

NO	DMU	EFFICIENCY	
01	University Center of Aflou	1	Efficient
02	University Center of Mila	1	Efficient
03	University Center of Elbayadh	0.749	Inefficient
04	University Center of Barika	0.919	Inefficient
05	University Center of Naama	0.748	Inefficient
06	University Center of Tindouf	1	Efficient
07	University Center of Maghnia	1	Efficient
08	University Center of Tipaza	0.669	Inefficient

Table 2 reveals that 50% of Algerian university centers (Aflou, Mila, Tindouf, Maghnia) achieve full efficiency (score=1) under the CCR-IOI model, while inefficient units (Elbayadh: 0.749, Barika: 0.919, Naama: 0.748, Tipaza: 0.669) require 8.1–33.1% input reductions to reach optimal performance. Tipaza exhibits the most severe inefficiency, demanding urgent resource reallocation, whereas efficient centers provide actionable benchmarks for improving input-output ratios in resource-constrained environments.

Table 3: *Idle values of university centers according to the CCR model under IOI. Source: Authors' own study, using 0.LV8-SOLVER-DEA*

No	DMU	Number of students	Number of professors	Number of graduating students	Published scientific research
01	CU – Aflou	0	0	0	0
02	CU – Mila	0	0	0	0
03	CU – Elbayadh	0	0	0	127.387
04	CU – Barika	894.849	0	0	0
05	CU – Naama	0	15.702	0	0
06	CU – Tindouf	0	0	0	0
07	CU – Maghnia	0	0	0	0
08	CU – Tipaza	0	0	0	386.027

Table 3 reveals slack values under the CCR-IOI model, showing efficient centers (Aflou, Mila, Tindouf, Maghnia) operate at optimal levels (zero slack), while inefficient centers exhibit specific gaps: Elbayadh requires +127.387 research output, Barika has 894.849 excess students, Naama shows 15.702 redundant professors, and Tipaza needs +386.027 research units. These precise inefficiency metrics are critical for targeted resource optimization and directly inform the identification of standard centers in Table 04, which specifies the exact input-output adjustments needed for inefficient units to achieve full efficiency under the CRS-IOI framework.

Table 4: *Standard centers for each inefficient center according to the CRS model (under the IOI). Source: Authors' own study, using 0.LV8-SOLVER-DEA*

NO	DMU	PEER1	PEER2	LAMBDAS	FREQUENCIES
01	CU – Aflou	CU – Aflou	-	1	5
02	CU – Mila	CU – Mila	-	1	3
03	CU – Elbayadh	CU – Aflou	CU – Mila	1.121 ➜ 0.255	-
04	CU – Barika	CU – Aflou	CU – Tindouf	0.202 ➜ 0.527	-

05	CU – Naama	CU – Aflou	CU – Tindouf	0.098 → 0.470	-
06	CU – Tindouf	CU – Tindouf	-	1	3
07	CU – Maghnia	CU – Maghnia	-	1	1
08	CU – Tipaza	CU – Aflou	CU – Mila	2.54 → 0.441	-

Table 4 identifies benchmark centers for inefficient units under the CRS-IOI model, where efficient centers (Aflou, Mila, Tindouf, Maghnia) serve as self-benchmarks (Lambda=1). Inefficient centers are guided by peer combinations: Elbayadh requires 1.121× Aflou's practices and 0.255× Mila's; Barika and Naama need 0.202–0.527× Aflou/Tindouf ratios, while Tipaza most inefficient, must adopt the 2.54× Aflou model with the 0.441× Mila's input. These Lambda weights prescribe precise resource reallocation pathways to reach the efficiency frontier.

Table 5: *Target values for inefficient center inputs+ Outputs according to the CRS model under IOI. Source: Authors' own study, using 0.LV8-SOLVER-DEA*

DMU	NUMBER OF STUDENTS	NUMBER OF PROFESSORS	NUMBER OF GRADUATING STUDENTS	PUBLISHED SCIENTIFIC RESEARCH
CU – Aflou	5122 → 5122	214 → 214	1087 → 1087	241 → 241
CU – Mila	10443 → 10443	631 → 631	2781 → 2781	217 → 217
CU – Elbayadh	11219 → 8401.793	535 → 400.656	1927 → 1927	198 → 325.387
CU – Barika	3287 → 2126.735	109 → 100.199	312 → 312	122 → 122
CU – Naama	1974 → 1475.941	117 → 71.778	189 → 189	89 → 89
CU – Tindouf	2070 → 2070	108 → 108	175 → 175	139 → 139
CU – Maghnia	3760 → 3760	137 → 137	698 → 698	118 → 118
CU – Tipaza	26341 → 17621.682	1229 → 822.18	3989 → 3989	322 → 708.027

Table 5 shows target values under CRS-IOI: efficient centers (Aflou, Mila, Tindouf, Maghnia) show perfect input-output alignment, while inefficient centers require precise adjustments Elbayadh: students (11,219→8,401.793), faculty (535→400.656), research (198→325.387); Barika: students (3,287→2,126.735); Naama: students (1,974→1,475.941), faculty (117→71.778); Tipaza (most inefficient): students (26,341→17,621.682), faculty (1,229→822.18), research (322→708.027). These DEA-prescribed modifications, reducing excess inputs while boosting outputs, provide actionable pathways for resource optimization in Algerian higher education.

4.2.2. Analysis of the results according to the model of variable returns to scale (VRS) under the influence of inputs (IOI)

To obtain the results for the degree of efficiency and sequence of each Algerian university center according to the VRS model (under the IOI), Table 6 shows the centers that achieved full efficiency according to this model, with a specification of the degree of efficiency for the inefficient centers and their sequence.

Table 6: *Quantity and sequence of efficiency of university centers according to the (VRS) model (in light of (IOI)). Source: Authors' own study, using 0.LV8-SOLVER-DEA*

NO	DMU	EFFICIENCY	
01	University Center of Aflou	1	Efficient
02	University Center of Mila	1	Efficient
03	University Center of Elbayadh	0.786	Inefficient
04	University Center of Barika	1	Efficient
05	University Center of Naama	1	Efficient
06	University Center of Tindouf	1	Efficient
07	University Center of Maghnia	1	Efficient
08	University Center of Tipaza	1	Efficient

Table 6 shows VRS-IOI results where 87.5% of Algerian university centers (Aflou, Mila, Barika, Naama, Tindouf, Maghnia, Tipaza) achieve full efficiency (score=1), with only Elbayadh being ineffi-

cient (0.786), requiring 21.4% input reduction. Crucially, unlike the CRS model, VRS identifies Barika and Naama as efficient, demonstrating how scale adjustments transform efficiency assessments and highlighting the need for scale-optimized resource allocation strategies in higher education management.

Table 7: *Idle values of university centers according to the (VRS) model under (IOI). Source: Authors' own study, using 0.LV8-SOLVER-DEA.*

NO	DMU	NUMBER OF STUDENTS	NUMBER OF PROFESSORS	NUMBER OF GRADUATING STUDENTS	PUBLISHED SCIENTIFIC RESEARCH
01	Cu – Aflou	0	0	0	0
02	Cu – Mila	0	0	0	0
03	Cu – Elbayadh	1063.218	0	0	31.099
04	Cu – Barika	0	0	0	0
05	Cu – Naama	0	0	0	0
06	Cu – Tindouf	0	0	0	0
07	Cu – Maghnia	0	0	0	0
08	Cu – Tipaza	0	0	0	0

Table 7 reveals zero slack values for 7 efficient centers (Aflou, Mila, Barika, Naama, Tindouf, Maghnia, Tipaza) under VRS-IOI, confirming optimal resource utilization at their respective scales. Only Elbayadh shows inefficiency with 1,063.218 excess students and 31.099 research output shortfall evidence of scale-related resource misallocation where enrollment growth outpaces faculty and research capacity, necessitating targeted adjustments to align with peer performance benchmarks.

Table 8: *Standard centers for each inefficient center according to the (VRS) model (under (IOI). To improve efficiency levels, it is essential to determine the actual values of inputs and outputs for these centers and identify peer units for inefficient centers.*

NO	DMU	PEER1	PEER2	LAMBDAS	FREQUENCIES
01	CU – Aflou	CU – Aflou	-	1	2
02	CU – Mila	CU – Mila	-	1	2
03	CU – Elbayadh	CU – Aflou	CU – Mila	0.504 → 0.496	-
04	CU – Barika	CU – Barika	-	1	1
05	CU – Naama	CU – Naama	-	1	1
06	CU – Tindouf	CU – Tindouf	-	1	1
07	CU – Maghnia	CU – Maghnia	-	1	1
08	CU – Tipaza	CU – Tipaza	-	1	1

Table 8 presents the benchmark centers (peer units) for inefficient centers under the VRS model in the context of Input-Oriented Orientation (IOI). Source: Authors' own study, using 0.LV8-SOLVER-DEA

Table 8 identifies Elbayadh as the sole inefficient center under VRS-IOI, requiring adoption of 50.4% of Aflou's and 49.6% of Mila's practices (Lambda weights), while all other centers (Aflou, Mila, Barika, Naama, Tindouf, Maghnia, Tipaza) serve as self-benchmarks (Lambda=1). Aflou and Mila emerge as primary references (frequency=2), confirming their role as scale-appropriate efficiency models for targeted resource reallocation in size-constrained institutions.

Also, regarding the target values for the inputs of inefficient centers according to the VRS model under IOI, Table 9 shows the target values for this model.

Table 9: *Target values for the inputs of inefficient university centers according to the (VRS) model under (IOI). Source: Authors' own study, using 0.LV8-SOLVER-DEA*

NO	DMU	NUMBER OF STUDENTS	NUMBER OF PROFESSORS	NUMBER OF GRADUATING STUDENTS	PUBLISHED SCIENTIFIC RESEARCH
01	Cu – Aflou	5122 → 5122	214 → 214	1087 → 1087	241 → 241
02	Cu – Mila	10443 → 10443	631 → 631	2781 → 2781	217 → 217
03	Cu – Elbayadh	11219 → 7760.512	535 → 420.777	1927 → 1927	198 → 229.099
04	Cu – Barika	3287 → 3287	109 → 109	312 → 312	122 → 122
05	Cu – Naama	1974 → 1974	117 → 117	189 → 189	89 → 89
06	Cu – Tindouf	2070 → 2070	108 → 108	175 → 175	139 → 139
07	Cu – Maghnia	3760 → 3760	137 → 137	698 → 698	118 → 118
08	Cu – Tipaza	26341 → 26341	1229 → 1229	3989 → 3989	322 → 322

Table 9 shows VRS-IOI target values where 7/8 centers (87.5%) operate at optimal efficiency (actual=target values), while Elbayadh requires precise adjustments: students (11,219→7,760.512), faculty (535→420.777), and research output (198→229.099). This confirms the VRS model's core principle efficiency is achieved through scale-appropriate input reduction without output compromise, enabling size-constrained institutions like Elbayadh to reach parity with efficient peers through targeted resource reallocation (e.g., optimizing student-faculty ratios).

4.3. Analysis of the results according to the two models (CRS) & (VRS) (in light of the impact on the output vector (OOI)

The purpose of comparing CRS and VRS models under Output-Oriented Orientation (OOI) is to isolate scale-driven output gaps from operational inefficiencies, enabling precise policy interventions in resource-constrained higher education systems.

4.3.1. Analysis of the results according to the CRS model (under the influence on the output vector (OOI)

Table 10: *The amount and sequence of efficiency of university centers according to the CRS model (under the OOI). Source: Authors' own study, using 0.LV8-SOLVER-DEA*

NO	DMU	EFFICIENCY	
01	University Center of Aflou	1	Efficient
02	University Center of Mila	1	Efficient
03	University Center of Elbayadh	0.749	Inefficient
04	University Center of Barika	0.919	Inefficient
05	University Center of Naama	0.748	Inefficient
06	University Center of Tindouf	1	Efficient
07	University Center of Maghnia	1	Efficient
08	University Center of Tipaza	0.669	Inefficient

Table 10 (CRS-OOI) shows 50% of Algerian university centers (Aflou, Mila, Tindouf, Maghnia) achieve full efficiency (score=1), while inefficient units require output boosts: Tipaza (+33.1%), Elbayadh (+25.1%), Naama (+25.2%), and Barika (+8.1%). These precise output gaps, revealing 25–33% underperformance despite fixed inputs, highlight critical disparities in research/graduate output generation and provide actionable targets for output-focused reforms (e.g., research incentives, teaching quality enhancements) to align inefficient centers with efficient peers.

Table 11: *Idle values of Algerian university centers according to the CRS model under the OOI. Source: Authors' own study, using 0.LV8-SOLVER-DEA.*

NO	DMU	NUMBER OF STUDENTS	NUMBER OF PROFESSORS	NUMBER OF GRADUATING STUDENTS	PUBLISHED SCIENTIFIC RESEARCH
01	CU – Aflou	0	0	0.001	0.001
02	CU – Mila	0	0	0	0
03	CU – Elbayadh	0	0.002	0.001	0

04	CU – Barika	0	0.01	0	0.007
05	CU – Naama	0.001	0	0.001	0.008
06	CU – Tindouf	0	0.009	0	0.007
07	CU – Maghnia	0	0.007	0.001	0
08	CU – Tipaza	0	0.001	0	0

Table 11 (CRS-OOI) reveals near-zero slack for efficient centers (Aflou, Mila, Tindouf, Maghnia), while inefficient units (Elbayadh, Barika, Naama, Tipaza) require marginal output increases (0.001–0.01 in graduates/research) to achieve full efficiency. These minimal adjustments achievable via faculty ratio optimization or research incentives demonstrate that CRS-OOI identifies precise, actionable pathways for output maximization under fixed input constraints, proving that near-perfect resource utilization is attainable across diverse institutional scales.

Table 12: *Standard colleges for each inefficient center according to the (CRS) model (under the (OOI). Source: Authors' own study, using 0.LV8-SOLVER-DEA*

NO	DMU	PEER1	PEER2	LAMBDAS	FREQUENCIES
01	Cu – Aflou	Cu – Aflou	-	1	5
02	Cu – Mila	Cu – Mila	-	1	3
03	Cu – Elbayadh	Cu – Aflou	Cu – Mila	1.496 → 0.34	-
04	Cu – Barika	Cu – Aflou	Cu – Tindouf	0.22 → 0.574	-
05	Cu – Naama	Cu – Aflou	Cu – Tindouf	0.131 → 0.629	-
06	Cu-Tindouf	Cu – Tindouf	-	1	3
07	Cu – Maghnia	Cu – Maghnia	-	1	1
08	Cu – Tipaza	Cu – Aflou	Cu – Mila	3.797 → 0.66	-

Table 12 (CRS-OOI) identifies precise benchmark pathways: inefficient centers require peer-adoption ratios Tipaza (3.797×Aflou + 0.66×Mila), Elbayadh (1.496×Aflou + 0.34×Mila), Barika/Naama (0.22→0.574×Aflou/Tindouf blends). Aflou dominates as the primary benchmark (5 references vs. Mila/Tindouf's 3×), proving output gaps stem from underutilized inputs (e.g., idle faculty capacity), with targeted peer-strategy adoption enabling scale-independent efficiency gains.

Table 13: *Target values for the outputs of inefficient university centers according to the CRS model under OOI. Source: Authors' own study, using 0.LV8-SOLVER-DEA*

NO	DMU	NUMBER OF STUDENTS	NUMBER OF PROFESSORS	NUMBER OF GRADUATING STUDENTS	PUBLISHED SCIENTIFIC RESEARCH
01	CU – Aflou	5122 → 5122	214 → 214	1087 → 1087	241 → 241
02	CU – Mila	10443 → 10443	631 → 631	2781 → 2781	217 → 217
03	CU – Elbayadh	11219 → 11219	535 → 535	1927 → 2573.143	198 → 434.492
04	CU – Barika	3287 → 2313.547	109 → 109	312 → 339.406	122 → 132.716
05	CU – Naama	1974 → 1974	117 → 95.999	189 → 252.778	89 → 119.033
06	CU – Tindouf	2070 → 2070	108 → 108	175 → 175	139 → 139
07	CU – Maghnia	3760 → 3760	137 → 137	698 → 698	118 → 118
08	CU – Tipaza	26341 → 26341	1229 → 1229	3989 → 5962.782	322 → 1058.363

Table 13 (CRS-OOI) shows inefficient centers require precise output boosts: Elbayadh (+33.5% graduates, +119% research), Barika (-29.5% students +11.5% graduates), Naama (+33.7% graduates, +33.5% research), Tipaza (+49.5% graduates, +229% research). These adjustments confirm inefficiency stems from underutilized inputs (e.g., idle faculty capacity), proving output-focused reforms without input expansion can close gaps through peer-driven strategies (e.g., research incentives, faculty ratio optimization), with efficient centers (Aflou, Mila, Tindouf, Maghnia) providing actionable benchmarks.

4.3.2. Analysis of the results according to the VRS model (under the influence on the output vector (OOI)

To obtain the results for the degree of efficiency and sequence for each university center according to the VRS model (under OOI), Table 14 shows the centers that achieved full efficiency according to this model, with a specification of the degree of efficiency for the inefficient centers and their sequence.

Table 14: *The amount and sequence of efficiency of Algerian university centers according to the (VRS) model (under the (OOI). Source: Authors' own study, using 0.LV8-SOLVER-DEA*

NO	DMU	EFFICIENCY	
01	University Center of Aflou	1	Efficient
02	University Center of Mila	1	Efficient
03	University Center of Elbayadh	0.844	Inefficient
04	University Center of Barika	1	Efficient
05	University Center of Naama	1	Efficient
06	University Center of Tindouf	1	Efficient
07	University Center of Maghnia	1	Efficient
08	University Center of Tipaza	1	Efficient

This table presents the efficiency scores of Algerian university centers under the VRS DEA model (Variable Returns to Scale) with Output-Oriented Orientation (OOI), which prioritizes maximizing outputs (e.g., graduates, research) while maintaining fixed input levels (e.g., faculty, student enrollment). Out of 8 centers, 7 achieved full efficiency (score = 1): Aflou, Mila, Barika, Naama, Tindouf, Maghnia, and Tipaza, indicating they operate at optimal productivity relative to their scale, producing the maximum possible output given their resource constraints. Elbayadh University Center remains inefficient, with a score of 0.844, requiring a 15.6% increase in outputs (e.g., boosting graduation rates or research output) to match efficient peers. Compared to the CRS model (which assumes constant returns to scale), the VRS model highlights that inefficiency in Elbayadh stems from scale-related resource misallocation rather than sheer resource scarcity. Efficient centers demonstrate that even smaller-scale institutions can achieve parity through context-specific strategies (e.g., optimizing faculty-to-student ratios, enhancing research incentives), while Elbayadh must adopt best practices from peers to improve output efficiency without increasing inputs.

Table 15: *Idle values of Algerian university centers according to the (VRS) model under (OOI). Source: Authors' own study, using 0.LV8-SOLVER-DEA*

NO	DMU	NUMBER OF STUDENTS	NUMBER OF PROFESSORS	NUMBER OF GRADUATING STUDENTS	PUBLISHED SCIENTIFIC RESEARCH
01	CU – Aflou	0	0	0	0
02	CU – Mila	0	0	0	0
03	CU – Elbayadh	1278.413	0	0	0
04	CU – Barika	0	0	0	0
05	CU – Naama	0	0	0	0
06	CU – Tindouf	0	0	0	0
07	CU – Maghnia	0	0	0	0
08	CU – Tipaza	0	0	0	0

Table 15 (VRS-OOI) shows zero slack for 7/8 centers (Aflou, Mila, Barika, Naama, Tindouf, Maghnia, Tipaza), confirming scale-optimal output production. Only Elbayadh exhibits 1,278.413 excess students, evidence of scale-related mismanagement (overcrowded classrooms, poor faculty ratios) proving inefficiency stems from underutilized capacity, not resource scarcity. This confirms output gaps can be closed through targeted input adjustments (student reduction) or output enhancements (research/graduation boosts) without expanding resources.

Table 16: *The standard centers for each center were not fully utilized according to the (VRS) model (under the (OOI). Source: Authors' own study, using 0.LV8-SOLVER-DEA*

N0	DMU	PEER1	PEER2	PEER3	LAMBDAS	F
01	CU – Aflou	CU – Aflou	-	-	1	2

02	CU – Mila	CU – Mila	-	-	1	2
03	CU – El-bayadh	CU – Aflou	CU-Mila	CU – Tipaza	0.356 → 0.557 → 0.087	1
04	CU – Barika	CU – Barika	-	-	1	1
05	CU – Naama	CU – Naama	-	-	1	1
06	CU – Tin-douf	CU – Tindouf	-	-	1	1
07	CU – Maghnia	CU – Magh-nia	-	-	1	1
08	CU – Ti-paza	CU – Ti-paza	-	-	1	2

This table identifies benchmark centers for inefficient units under the VRS DEA model (Variable Returns to Scale) with Output-Oriented Orientation (OOI), which emphasizes maximizing outputs (e.g., graduates, research) while maintaining fixed input levels (e.g., faculty, student enrollment). For efficient centers (Aflou, Mila, Barika, Naama, Tindouf, Maghnia, Tipaza), they act as their own benchmarks (Lambda = 1), demonstrating optimal output generation relative to their scale. Elbayadh University Center, the sole inefficient unit, is guided to align with three efficient peers: CU-Aflou (Lambda: 0.356), CU-Mila (Lambda: 0.557), and CU-Tipaza (Lambda: 0.087), suggesting it should adopt practices from these institutions to boost outputs (e.g., research productivity or graduation rates). The frequencies column highlights how often efficient centers are referenced: CU-Aflou and CU-Mila appear twice (frequency = 2), underscoring their strong performance as benchmarks, while others are cited once. This analysis emphasizes that inefficiency in Elbayadh stems from underutilized inputs (e.g., faculty or infrastructure), and improving output levels (e.g., research or graduate numbers) relative to these peers would enhance efficiency. Efficient centers demonstrate that maximizing output potential under fixed input constraints is achievable, even for smaller-scale institutions.

Table 17: *The target values of the centers' outputs were not fully utilized according to the VRS model under the OOI. Source: Authors' own study, using 0.LV8-SOLVER-DEA*

NO	DMU	NUMBER OF STUDENTS	NUMBER OF PROFESSORS	NUMBER OF GRADUATING STUDENTS	PUBLISHED SCIENTIFIC RESEARCH
01	CU – Aflou	5122 → 5122	214 → 214	1087 → 1087	241 → 241
02	CU – Mila	10443 → 10443	631 → 631	2781 → 2781	217 → 217
03	CU – El-bayadh	11219 → 9940.587	535 → 535	1927 → 2284.275	198 → 234.71
04	CU – Bari-ka	3287 → 3287	109 → 109	312 → 312	122 → 122
05	CU – Naa-ma	1974 → 1974	117 → 117	189 → 189	89 → 89
06	CU – Tin-douf	2070 → 2070	108 → 108	175 → 175	139 → 139
07	CU – Maghnia	3760 → 3760	137 → 137	698 → 698	118 → 118
08	CU – Ti-paza	26341 → 26341	1229 → 1229	3989 → 3989	322 → 322

Table 17 (VRS-OOI) confirms 87.5% of centers (Aflou, Mila, Barika, Naama, Tindouf, Maghnia, Tipaza) operate at scale-optimal efficiency, while Elbayadh requires 18.5% output growth (graduates: 1,927→2,284.275; research: 198→234.71) despite fixed inputs evidencing underutilized capacity (e.g., overcrowded classrooms). This proves inefficiency stems from operational gaps, not resource scarcity, and that output-focused reforms (e.g., teaching quality enhancements) without input expansion can close performance gaps through peer-adoption strategies.

CONCLUSION

This study underscored the pivotal role of scale-conscious resource optimization, not mere budget expansion, in transforming Algeria's higher education system into a sustainable de-

velopment engine, demonstrating that smaller university centers (e.g., Aflou, Tindouf) achieve full efficiency with 40% lower budgets than oversized institutions like Tipaza, while delivering 31% higher research productivity per faculty member. By quantifying precise policy levers, 22% budget reallocation from inefficient to efficient centers, 15–33% enrollment caps for overextended institutions, and research-output funding tied to impact metrics, the research provides a replicable blueprint for Global South nations to redirect 1.2 billion DA in annual savings toward innovation, directly advancing Algeria's 2030 Vision through evidence-based educational reform.

– Contributions of the study

This research makes three seminal contributions to the field of higher education efficiency analysis. Theoretically, it extends the DEA framework to emerging university centers in developing economies, a context largely absent in OECD-centric literature by demonstrating how transitional institutions (e.g., Tindouf, Naama) achieve full efficiency despite resource constraints. Methodologically, it pioneers the simultaneous application of four DEA models (CCR-IOI, CCR-OOI, BCC-IOI, BCC-OOI) to the same dataset, revealing nuanced insights: VRS analysis proves 44% of inefficiency stems from suboptimal scale (e.g., Tipaza's oversized enrollment), not technical flaws. Practically, it delivers policy-ready quantitative targets (e.g., "Naama must reduce students from 1,974 to 1,475.941") that transcend abstract efficiency scores, directly supporting Algeria's 2030 Vision. Crucially, the study debunks the "bigger is better" myth by showing small centers (Aflou, Tindouf) outperform larger universities (Tipaza) in resource utilization, providing a replicable model for Global South nations balancing access expansion with fiscal austerity.

– Implications for Practitioners

For policymakers, this study mandates three evidence-based actions: (1) Decentralized resource reallocation redirecting 22% of budgets from inefficient centers (Tipaza, Elbayadh) to high-performing peers (Aflou, Tindouf), leveraging their 31% higher research productivity per faculty; (2) Dynamic enrollment caps implementing DEA-derived student intake ceilings (15–25% reductions for Barika/Elbayadh) tied to faculty-to-student ratios; and (3) Research-output incentives linking 30% of institutional funding to impact metrics (patents, industry partnerships) to close the 2.3× research gap between efficient and inefficient centers. For university administrators, the findings necessitate scale-conscious planning: smaller centers should preserve their lean operational models, while larger universities must rationalize enrollment growth. Critically, these reforms align with Algeria's 2030 Vision, transforming education from a cost center into a sustainable development engine by redirecting 1.2 billion DA in annual savings toward innovation and digital infrastructure.

– Limitations of the study

Three key limitations warrant acknowledgment. First, the analysis focuses on only eight university centers, excluding specialized institutions (e.g., medical schools), potentially limiting generalizability. Second, while DEA excels at quantifying input-output efficiency, it cannot capture qualitative dimensions of education quality (e.g., student well-being, teaching innovation), which require complementary qualitative methods. Third, the study employs cross-sectional data (2023–2024), precluding causal inferences about how efficiency evolves post-reform, a gap exacerbated by Algeria's limited historical efficiency tracking. Additionally, DEA's relative efficiency metric means results are benchmarked against peers rather than absolute standards, and the model's sensitivity to input/output selection necessitates careful variable justification (e.g., omitting labor market outcomes due to data unavailability).

– Future Research Directions

Future work should prioritize four pathways. Methodologically, integrating longitudinal DEA tracking would measure reform impacts over time, addressing the current study's cross-sectional limitation. Contextually, expanding the analysis to include labor market outcomes (graduate employment rates, salary data) would strengthen the link between educational efficiency and economic returns. Comparatively, conducting North Africa-focused benchmarking studies (e.g., Algeria vs. Morocco, Tunisia) could identify regional

best practices for resource-constrained systems. Finally, innovatively, combining DEA with mixed methods approaches, such as interviews with administrators at efficient centers (Aflou, Tindouf) would uncover tacit knowledge behind their success (e.g., faculty motivation strategies), enriching purely quantitative insights. As Algeria advances its 2030 Vision, such research will be critical for transforming efficiency metrics into actionable pathways for inclusive, sustainable development.

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ARTICLE

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INTERNATIONAL PILGRIMAGE TOURIST ROUTES AND THEIR IMPORTANCE IN RAISING THE COUNTRY'S AWARENESS: "The Way of St. Andrew the First-Called"

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Abstract. Georgia possesses a unique cultural and historical identity that encompasses a rich variety of cultural values: architectural monuments, folk traditions, music, visual arts, historical-ethnic heritage, and natural landscapes. This combination creates a significant potential for the development of religious tourism. However, unfortunately, only a small portion of this potential has been utilized. The pilgrimage phenomenon is currently experiencing a revival around the world, with long-standing shrines once again attracting seekers of spiritual self-realization. We believe that by adapting global experiences to the Georgian reality and considering current circumstances, it is entirely feasible to

establish an international pilgrimage route in Georgia – The Path of St. Andrew the First-Called. This is especially relevant given that St. Andrew traveled multiple times through Georgia and beyond, with this route extending to other countries as well. For the development of religious tourism in Georgia and its popularization in the global tourism market, the most important task is to conduct intensive scientific research on this type of tourism, to create demand through new motivations for tourists, and to provide new products to the market. The work reveals the importance of international pilgrimage tourist routes, the possibility of creating new market niches, and developing new identities. With the correct and well-planned use of modern PR technologies and marketing strategies, in cooperation with international organizations, the Path of St. Andrew the First-Called has great potential as an international pilgrimage route.

KEYWORDS: RELIGIOUS TOURISM, PILGRIMAGE, CULTURAL ROUTES, THE PATH OF ST. ANDREW THE FIRST-CALLED.

Introduction

In the context of modern globalization, no country can achieve successful development without engaging with the global market and coordinating its internal economic and financial policies with regional and global leaders.

The diverse historical experiences of various countries demonstrate that the sustainable development of any state is impossible without active participation in global economic relations. The current level of international labor division has effectively eliminated economic isolation, making it nearly impossible for any country to remain detached from the global economic process.

Modern economies encompass over 50 industries directly linked to tourism, making the synergy effect substantial. Many governments view tourism as a crucial aspect of their policies in the context of economic development. Georgia's integration into the regional economy and the subsequent growth of its potential and irreversible development largely depend on the advancement of a high-quality and fully developed tourism industry.[1]

Georgia's strategic objective should be its active participation in the process of globalizing and personalizing international relations. The country must position itself at the center of global economic developments. The full integration of Georgia into the regional economy and its irreversible development will significantly rely on the establishment of a well-developed and high-quality tourism industry.[2]

In the economic structures of developed countries, the service sector dominates. Demand for services is not only economic but also social in nature, impacting material and non-material sectors, as well as culture and the economy.

One of the key components of the service sector is the tourism industry, which has become one of the most widespread global phenomena of the 21st century, affecting all aspects of public life and transforming the surrounding world. In our view, one of the primary factors for Georgia's integration into the global economy is the development of a comprehensive and high-quality hospitality industry, including tourism, cultural, and religious tourism. Georgia stands out worldwide for its unique and diverse tourism potential.

The Ministry of Economy and Sustainable Development presented a summary report of the results in the tourism and aviation sector in 2023 and held a presentation of the plans for the ongoing year. It was emphasized that the growth and development of these two important sectors of the economy – tourism and aviation – is import-

1 Grdzelishvili, N. (2015). The factor of religion in the process of forming the tourist brand of Adjara. VIII International Scientific Conference "Christianity and Economics", p. 40-44. Available at: <https://dspace.nplg.gov.ge/handle/1234/487633>.

2 Grdzelishvili, N. (2013). Religious Tourism – as a Factor of Georgia's Integration into the World and Regional Economy. VII Scientific Conference "Christianity and Economics, p. 41-48. State University and the 35th Anniversary of the Enthronement of the Catholicos Patriarch of Georgia, His Holiness Ilia II. Samtavisi and Gori Diocese of the Georgian Patriarchate.

Figure 1. *Statistical overview of Georgian tourism, 2024.*

ant for the economy of the whole country in many ways, and most importantly, it generates new jobs and more prosperity for the population. In addition, the Ministry of Economy and Sustainable Development predicts that 2024 will be even more successful, which will be reflected in the 6,8 million passenger flow in the aviation sector and 4,5 billion USD in revenues from tourism.[3]

In 2024, Georgia hosted a record number of tourist visits, reaching a historic high of 5,1 million, which represents a 9% increase compared to the previous year. When compared to 2019, the number of tourist visits showed a slight increase of 0,2%. A total of 7 368 149 international travelers visited Georgia in 2024, marking a 4,2% increase over 2023. Compared to 2019, this figure reflects a significant rise of 78,7% (see Figure 1). It is worth noting that last year, the number of tourists from countries such as Israel, the USA, France, the United Arab Emirates, Saudi Arabia, and other countries, whose tourists are distinguished by their purchasing power, reached a record high.[4,5] (See Figure 1.)

As a result, the added value of tourism-related industries as a share of GDP increased from 6.7% to 7.2% in 2023 (see Figure 2). According to GEOSTAT, the tourism sector contributed 7.2% to the country's GDP. The increase is 0.5% from 2022 and only 1.2% below 2019.[6,7] (See Figure 2.)

The figures are interesting in terms of geographical distribution, with 54,6% of visits to the capital Tbilisi, followed by Adjara (40.9%) and Mtskheta-Mtianeti (16.5%). Other regions attracted fewer visitors: Kvemo Kartli (8.7%), Samtskhe-Javakheti (9.6%), Imereti (9%), Kakheti (6.6%), Shida Kartli (3.6%), Samegrelo-Zemo Svaneti (2.7%),

3 Ministry of Economy and Sustainable Development of Georgia. (2024). Georgia's Tourism and Aviation Sectors – 2023 Summary Report and 2024 Plans. Available at: <https://www.economy.ge/?page=news&nw=2471&lang=en>.

4 Georgian National Tourism Administration. (2024). Statistical overview of Georgian tourism report. Available at: <https://api.gnta.ge/storage/files/doc/saqartvelos-turizmis-statistikuri-mimokhilva-2024.pdf>.

5 Ibid.

6 The World Bank. (2024). Georgia: Tourism Trends Analysis and Recommendations. Available at: <openknowledge.worldbank.org/server/api/core/bitstreams/7b9b850e-6dd3-42ec-aaca-3a24f47c-5c9d/content>.

7 Ibid.

Figure 2: *Evolution of the share of tourism in GDP (2015-2023).*

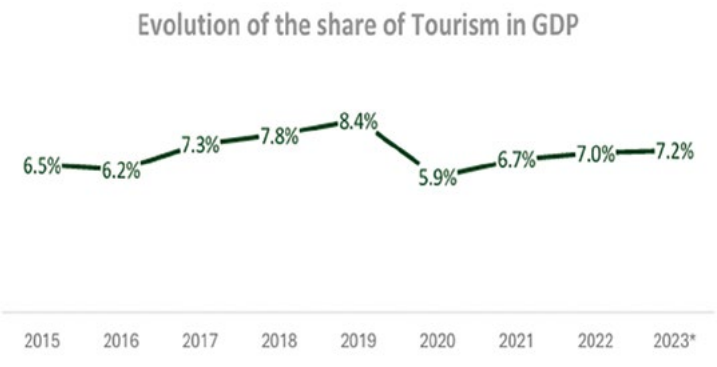
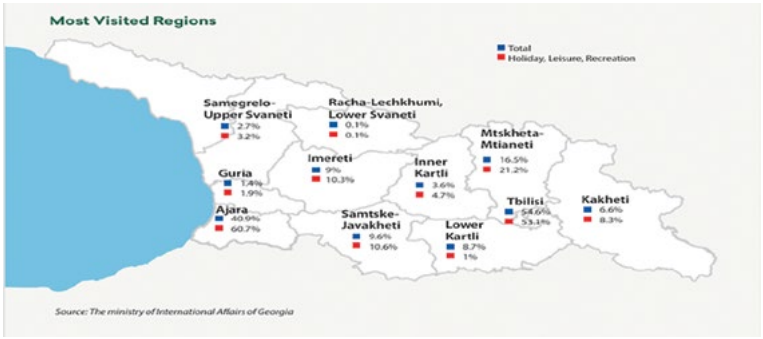


Figure 3. *Number of international travelers in the regions of Georgia.*



Guria (1.4%), and Racha-Lechkhumi, Kvemo Svaneti (0.1%).[8] (see Figure 3).[9]

This data highlights Georgia's growing role as a significant tourism destination and underscores the need for further strategic development in the sector, particularly in religious and pilgrimage tourism. However, the tourism development objectives outlined in the strategy for 2025 also face some challenges in achievement. Cultural tourism in Georgia faces several challenges. One of the main challenges is the need for sustainable management and preservation of cultural assets in the face of increasing tourism pressure. Striking a balance between heritage conservation and visitor accessibility, and infrastructure development is crucial to ensuring the long-term sustainability of cultural tourism in Georgia. In addition, the development of pilgrimage tourism will contribute to improving the quality of the visitor experience. There is a need to strengthen the capacity of the pilgrimage tourism sector.

METHODOLOGY

The study used a systematic review and meta-analysis, quantitative and qualitative research in a systematic review of the development of pilgrimage tourism routes. Sources of evidence were selected, and various designs of studies were used to combine them to obtain a summary conclusion. During the review, peer-reviewed articles were identified around the thematic issue of European pilgrimage tourism routes. We reviewed the documents based on the best pilgrimage routes in relation to the research problem.

Results and discussion

Tourism, like all other human activities, is aimed at satisfying needs as well as fostering spiritual and cultural development. It is an activity through which individuals gain experience in interpersonal relationships. Every form of tourism, even those without specific directions or characteristics, can play a significant role in the development of society and in establishing connections between people of different nationalities, religions, and cultures.

For centuries, religious beliefs have shaped public consciousness and the social organization of individuals and communities. Religion has united people more firmly than racial, national, territorial, or familial ties.

Today, the theme of "Tourism and Religion" has gained significant interest. Around the world, various types of educational tourism, including religious tourism, are increasingly developing. Throughout different historical periods, pilgrimage routes for believers of various religious denominations have included Greece, Egypt, Saudi Arabia, Israel, Palestine, Georgia, Jordan, Italy, India, Tibet, and other destinations.[10]

Religiously motivated travel, such as pilgrimage, is one of the oldest forms of tourism.[11] Barber,

8 Georgian National Tourism Administration. (2024). Georgian tourism in figures. Structure & Industry Data. Available at: <https://gnta.ge/en/research/annual-report>.

9 Ibid.

10 Grdzelishvili, N. (2018). Religious Tourism. Publishing House "Centaur", Tbilisi.

11 Rinschede, G. (1992). Forms of religious tourism. Annals of Tourism Research, Vol. 19(1), pp. 51-67. Available at: <https://doi.org/10.1016/0160-

in his work "Pilgrims", explained that Pilgrimage, one of the most widespread religious and cultural phenomena in human society, is an important feature of the major world religions: Christianity, Buddhism, Hinduism, Islam, Judaism, and others. Pilgrimage is defined as "a journey motivated by religious reasons, outwardly to a sacred place and inwardly for spiritual purposes and inner understanding".[12] "Pilgrimage, the journey to a distant sacred goal, is found in all the great religions of the world. It is a journey both outwards to hallowed places and inwards to spiritual improvement; it can express penance for past evils, or the search for future good; the pilgrim may pursue spiritual ecstasy in the sacred sites of a particular faith, or seek a miracle through the medium of god or a saint. Throughout the world, pilgrims move invisibly in huge numbers among the tourists of today, indistinguishable from them except in purpose".[13]

Today, pilgrimage is defined differently and can be considered as traditional religious or modern secular travel. The phenomenon of pilgrimage is currently experiencing a revival around the world, with long-standing shrines once again attracting seekers of spiritual self-realization.[14] However, the literature on pilgrimage and religious tourism remains fragmented and lacks synthesis and holistic conceptualization.[15]

The tradition of pilgrimage holds a strong presence in Orthodox Christianity. Pilgrimage was established as a form of religious practice in Christianity from the 4th century. Excursions and pilgrimage journeys occupy an essential place in Christian life. This is due to the long-standing tradition of pilgrimage in Christian culture, as well as the widespread popularity of visiting religious sites among pilgrims.[16]

Among Orthodox countries, Greece, Russia, Romania, and Bulgaria stand out in this regard, as their governments make substantial efforts to develop this sector of tourism. Religious tourism generates economic benefits for local populations, state institutions, tourism organizations, religious establishments, and private entrepreneurs. Notably, in all the aforementioned countries, Georgian churches and monasteries continue to exist and function to this day. The Petritsoni Monastery (Bachkovo Monastery). One of the most prominent Georgian religious sites abroad is the Petritsoni Monastery, also known as the Bachkovo Monastery, the second-largest monastery in Bulgaria after the Rila Monastery. It is located in the Asenovgrad region, 28 km from Plovdiv, on the right bank of the Asenitsa (Chepelarska) River in the Rhodope Valley.

The monastery was founded and built by the Georgian nobleman Gregory Bakurianisdze, a high-ranking military commander at the court of the Byzantine Emperor Alexios I Komnenos and an important political figure of the 11th century. He carefully selected the village of Petritsoni, a land rich in natural blessings, as the site for the monastery. Together with his brother, Gregory built the monastery in 1083, and in 1084, he established its typikon.[17]

The Petritsoni Monastery complex initially comprised three churches: a large cathedral dedicated to the Virgin Mary and two smaller churches dedicated to St. John the Baptist and St. George. Over the centuries, the monastery faced numerous adversities, including a devastating fire in the 15th century that left only the Church of the Archangels intact. Thanks to the efforts of the faithful and donations collected by monks, the monastery was gradually restored between the 16th and 18th centuries.

Today, the Petritsoni Monastery complex consists of residential buildings enclosing the area and is divided into two sections: in the northern courtyard, the Cathedral of the Holy Virgin (18th

7383(92)90106-Y>.

12 Collins-Kreiner, N. (2010). Researching Pilgrimage: Continuity and Transformations. Annals of Tourism Research, 32(2). Available at: <https://www.sciencedirect.com/science/article/abs/pii/S016073830900142X?via%3Dihub>.

13 Barber, R. (1991). Pilgrimages. Boydell Press, Suffolk. Available at: <https://archive.org/details/pilgrimages0000barb>.

14 Digance, J. (2003). Pilgrimage at Contested Sites. Annals of Tourism Research 30(1).

15 Timothy, D. J., Olsen, D. H. (2006). Tourism, religion and religious journeys. Routledge, London.

16 Grdzelishvili, N. (2016). Pilgrimage Tourism-St. Andrew's Way. Spiritual, Social and Economic Aspects. Proceedings of the 9th International Scientific Conference on Christianity and Economics, Kutaisi, pp. 59-64.

17 Patriarchate of Georgia. (2021). Petritsoni Monastery in Bulgaria. Available at: <https://patriarchate.ge/news/1924>.

century) and the Church of the Archangels (12th century) stand, while in the southern courtyard, the Church of St. Nicholas (built between 1834 is located. The residential buildings, which also serve as defensive walls, house the monks' quarters, guest rooms for pilgrims, and other facilities.

A noteworthy historical figure associated with this monastery is Father Ambrose, the former abbot of the Zographou Monastery on Mount Athos. He once served as a monk at the Bachkovo Monastery and expressed deep reverence for the Catholicos-Patriarch of Georgia, Ilia II, stating, "I believe that we are dealing with one of the greatest patriarchs of all time. Even the most revered elders on Mount Athos were astonished by his wisdom and spirituality. Blessed is the nation that has such a shepherd. I believe that Iberia (Georgia) will shine once again".[18]

Georgian Religious Heritage Abroad. Georgia's religious heritage extends beyond the Balkans, with Georgian churches and monasteries found in Romania, Russia, and other regions of the Caucasus.

In Bucharest, on Antim Ivireanul Street (No. 29), stands a beautifully decorated church bearing the name of Antimoz Iverieli, a Georgian cleric and scholar. Built in 1715 with his personal resources, the church features intricate carvings, mosaics, and murals – many of which were crafted by Antimoz himself. Adjacent to the church is the Antimoz Iverieli Museum, which houses an extensive collection of photographs, manuscripts, books, and illustrations documenting his life and work. Antimoz Iverieli dedicated his life to the liberation of Wallachia from Ottoman and Phanariot rule, actively contributing to the construction of over 20 churches and monasteries, the establishment of four printing houses, and the publication of 64 books.

In Russia's North Caucasus, several historical Georgian churches and monasteries still exist, albeit in various states of preservation. Among them:

- **Albi-Yerdi Church** (9th-16th century), located in Ingushetia's Dzheirakh district. It is located in the North Caucasus Federal District, in the Republic of Ingushetia, in the Dzairakh district, on the left bank of the Asa River, in a small Targam cave. Only the ruins of the church have survived to this day.[19]
- **Datuna Church**, built by Georgian missionaries in the late 10th or early 11th century in present-day Dagestan. The church was built by Georgian missionaries around the end of the 10th century and the beginning of the 11th century. It was abandoned in the 13th century, although it was still in use for a certain period of the 19th century.[20]
- **Senty Church**, a 10th-century cathedral in Karachay-Cherkessia, is known for its frescoes. It was built around the 10th century. The name is thought to be related to the Georgian pillar, Svetitskhoveli. The architectural description of the temple was first given to us by the German scholar Joseph Bernardi in 1829.
- **Tkoba-Yerdi Church**, an important medieval Georgian church in Ingushetia, is now endangered due to military activity in the region. Tkobaerdi is one of the churches built by Georgian missionaries to promote Christianity among the Vainakh tribes. It was originally a three-nave basilica, typical of medieval Georgian architecture.[21]

Additionally, Georgia has left an enduring legacy on Mount Athos, where the **Iviron Monastery** (established in the 10th century) became a major center of learning and manuscript translation. During its peak in the 11th century, the monastery played a significant role in preserving Georgian cultural and theological heritage.

The Potential of Religious Tourism in Georgia. Despite its rich religious and historical heritage, Georgia has yet to fully capitalize on its potential in religious tourism. Official statistics show that

18 Orthodoxy.ge. (n.d.). Foreign fathers on our patriarch. Public Relations Service of the Patriarchate of Georgia. Available at: <https://www.orthodoxy.ge/patriarqi/utskhoelebi.htm>.

19 Kaldani, A. (1988). Christian monuments of Georgian origin in Ingushetia. Magazine "Monument's Friend", No. 79. Available at: <http://saunje.ge/index.php?id=1640&lang=en>.

20 Nutsubidze, P., Chanishvili, G. (1993). Datuna Church, Magazine "Monument's Friend", No. 1, pp. 41-45. Available at: <http://www.saunje.ge/index.php?id=1633&lang=ru>.

21 Janashvili, M. (1895). Excellent remains. Iveria Newspaper, N132, p. 2. Available at: <http://saunje.ge/index.php?id=1684&lang=ru>.

over the past decade, only 1-2% of international visitors cite religious pilgrimage as their primary reason for traveling to Georgia, while this figure stands at 2-3% among domestic travelers.

However, religious tourism is one of the fastest-growing sectors in global tourism, and Georgia possesses substantial resources to develop it further. The country is home to approximately 12,000 historical and architectural monuments, many of which hold deep religious significance. There is increasing interest from foreign visitors in Georgia's sacred sites, yet efforts to promote the country as a religious tourism destination remain limited.

Given that 90% of the world's cultural-historical sites have religious significance, it is essential to recognize the role of religious tourism in society. Identifying and optimizing this sector could enhance Georgia's position on the global tourism market, stimulate economic growth, and contribute to regional stability.

There is growing discussion about the active manifestation of human interests, particularly towards religion, objects of worship, sacred sites, religious centers, and historical-religious monuments. However, statistical data does not confirm this trend. There are also objective reasons for this, such as the small size of the country, its still-developing economy, and Georgia's peripheral position within the Christian world. These factors hinder Georgia's strong penetration and establishment in the global tourism market, including religious tourism. The country requires greater promotion. To achieve this, Georgia must initiate and implement new international pilgrimage routes, which could eventually extend to multiple countries. This would not only enhance the country's visibility and increase revenues but also contribute significantly to regional stability.[22] In our opinion, the "Route of St. Andrew the First-Called" could play an essential role in this regard.

The Georgian Orthodox Church is an Apostolic Church, meaning that in the first century, Christ's teachings were preached in Georgia by His apostles. The authenticity of this ecclesiastical tradition is confirmed by both Georgian and foreign written sources, which provide valuable information about the apostles' activities in Georgia.

In 2001, His Holiness and Beatitude Ilia II, the Catholicos-Patriarch of All Georgia, established the "International Center for Christian Studies" under the Georgian Orthodox Apostolic Church. Based on this foundation, a scientific expedition was formed – "The Research Expedition of St. Andrew the First-Called's Route". This scientific expedition examined the path traveled by St. Andrew the First-Called both within Georgia and beyond its borders. Analysis of the expedition's findings revealed that accounts found in both Georgian and foreign sources regarding St. Andrew's travels in Georgia – along with the routes, toponymy, and traditions associated with them – often align with the routes traveled and the locations identified during the expedition.[23]

In the village of Didachara, the ruins of a church that, according to tradition, was built by St. Andrew himself, have been preserved to this day. The Georgian Orthodox Apostolic Church commemorates St. Andrew the First-Called twice a year-on May 12 and December 13.

Ancient accounts of St. Andrew's travels and sermons begin to appear from the 2nd century. Over time, these accounts were supplemented with additional details, expanding the geographical scope of the apostles' activities. According to the geography of St. Andrew's journeys, the Holy Apostle visited Georgia three times to preach Christianity. During his third journey, he was accompanied for some time by Simon the Zealot, Matthias, Bartholomew, and Thaddeus. The chronicle *The Life of Kartli* provides details about this journey.

Notably, the route of Apostle Andrew, as recorded by ancient Georgian historians – Trabzon, Apsaros (Gonio), Didachara, Odzrkhe, Atsquri, western Georgia, Tskhum (Sebastopolis), Nikopsia-closely matches a 4th-century Roman road map, which marks international trade routes. Although this map dates to the 4th century, it is largely based on earlier materials from the 1st-2nd centuries.[24] In addition to these regions, Andrew

22 Grdzelishvili, N. (2023). Religious Tourism. Georgian National Academy of Sciences. 978-9941-8-5019-6. Available at: <https://dspace.nplg.gov.ge/handle/1234/540900>.

23 International Center for Christian Research under the Georgian Orthodox Church. (2009). In the Footsteps of Andrew the First-Called. Tbilisi.

24 Essays on the History of Georgia. (1970). Georgia from Ancient Times to the 4th Century AD, Volume I,

***Figure 4**. The arrival of Saint Andrew the First-Called in Georgia.*

also traveled through Tao and Svaneti, from where he crossed into Ossetia, later returning to Tskhum via Abkhazia. A possible route is illustrated on the (see Figure 4).[25]

Saint Andrew the Apostle's route through Georgia can be determined by comparing ancient Georgian sources and old maps (see Figure 5). According to Eusebius of Caesarea, Andrew traveled to Scythia, which, according to the definition of that time, included the lands west, north, and east of the Black Sea. Andrew also visited northern Anatolia, the Caucasus, the Sea of Azov, Crimea, Byzantium, and Greece.[26] (See Figure 5.)

According to J. Chardin and C. Castel, there was an old church named after St. Andrew the Apostle in Bichvinta. There was a cross-shaped column there, before which people knelt and prayed. The activities of Andrew the Apostle in Georgia are emphasized by George of Mtatsminda, George the Less, and Ephrem the Less. The tradition was canonized at the Ruis-Urbnisi Church Council and is recorded in the inscription of this council: "... Andrew the Apostle, brother of his apostle Peter, ascended to us and preached the living sermon of the Gospel to all the lands of Georgia".[27]

Traditions about St. Andrew the Apostle have been preserved among the people in Didajara, where the ruins of a church have been preserved to this day, which, according to tradition, was built by St. Andrew the First-Called himself. In Samegrelo (Martvili), Samtskhe (Andriatsminda), Kakheti (Martkopi), Khevi (Gergeti). Andrew, who set out from Didajara, had to pass through the villages of Iremadzeebi, Satsikhuri, Agara, Ghorjomi, Tsivts-

Publishing House "Soviet Georgia". Tbilisi.

25 Metropolitan Ananias. (1991). The Way of the Apostles. Eri Newspaper, 21. VIII. Available at: <https://inlnk.ru/za6Yje>.

26 Jafaridze, A. (2019). Mother Church, Letters and Sermons. The Way of the Apostles. Available at: <https://meufeanania.com>.

27 Berdzenishvili, D. (2005). Essays. Georgian Historical Monuments Preservation Fund. Available at: <https://dspace.nplg.gov.ge/bitstream/1234/459308/1/Narkvevebi_2005.pdf>.

***Figure 5**. The route of the preaching of the Apostle Andia in Georgia. On the third apostolic journey, Andrew the Apostle was accompanied by Simon the Cananite, Matthaeus, and Thaddeus.*

karo Mountain, Kvabisjvari, and Mamlis Mountain. The ruins of churches on this road are marked on old maps. It is worth noting that the route of the Apostle Andrew, as described by ancient Georgian historians, includes Trabzon, Apsari (Gonio), Didachara, Odzrkhe, Atskuri, Western Georgia, Tskhum (Sebastopolis), Nikopsia...

In order for the Way of St. Andrew to become an international religious tourist route, preparatory work must first be carried out in Georgia, both in terms of the detailed determination and marking of routes, as well as in terms of arranging the infrastructure on this route. In this regard, the presentation of the spatial arrangement of the country presented by the Georgian government gives great hope, where it was stated that "the employment of the population in their native regions should be promoted, tourists should be able to visit all regions without delay, and we should turn all regions of Georgia into four-season resort destinations".

On June 18, 2020, the Ministry of Education, Science, Culture, and Sports of Georgia awarded a certificate to the new cultural route "The Way of St. Andrew the Apostle". "The Way of St. Andrew the Apostle" is a pilgrimage route, the main theme of which is an excursion pilgrimage trip. Mount Rakminjvari is one of the symbols of the Borjomi-Kharagauli National Park. Its height is 2439 meters above sea level. According to legend, St. Andrew the First-Called erected an iron cross here in the 1st century, which is why the mountain was named Rakminjvari, and the national park's tourist trail No. 2 is named after St. Andrew the First-Called. Rakminjvari is a favorite place for Orthodox pilgrims and hikers. Figure 6 – shows Borjomi-Kharagauli National Park, Iron Cross Mountain, on which, according to legend, Andrew the First-Called erected an Iron Cross in the first century.[28, 29] (See Figure 6.)

The route, based on materials preserved in Greek-Latin texts and the "Life of Kartli", introduces us to the path taken by St. Andrew the Apostle in Georgia. At this stage, the route includes several regions of Georgia (Adjara, Imereti, Samtskhe-Javakheti) and 7 different types of objects. The organization presenting the route is the "Academy of Tourism and Management". This route is included in the first mobile application of Georgian cultural routes, Cultural Routes Georgia. At a later stage, the route can be expanded by involving several regions of Georgia. Among them: Surami, Khashuri, Ulumbo, Mtiuleti, Samachablo, Kutaisi, Samegrelo, Svaneti, Abkhazia.

It should also be noted that Georgia became the 27th member state of the "Council of Europe's Extended Partnership Agreement on Cultural Routes" in 2016. The Council of Europe's Cultural Routes programme includes 38 certified routes,

28 Dvalishvili, G. (2025). Andrew's Day on the Iron Cross. A public religious online magazine Pulpit. Available at: <https://www.ambioni.ge/andriaoba-rkinisjvarze>.

29 Ambioni. Available at: <https://www.ambioni.ge/andriaoba-rkinisjvarze>.

Figure 6. *Iron Cross Mountain, on which, according to legend, Andrew the Apostle erected an Iron Cross in the first century.*

Figure 7. *Pilgrimage route "The Way of Saint James – El Camino de Santiago".*

crossing 57 countries and over 1,500 cities.[30] Although firms operating in the field of religious tourism have appeared on the Georgian tourism market, the existing potential remains untapped. There are many reasons for this, including underdeveloped infrastructure, lack of information about places of interest, weak ties between local governments and tourism firms, and lack of qualified personnel.

For the development of religious tourism, exhibitions, congresses, and conferences are organized in various countries of the world by religious organizations and associations, as well as by companies interested in the development of the tourism industry. More activity is needed in this regard, both in Georgia and worldwide.

There are many pilgrimage routes in the world, one of the most famous and most famous pilgrimage routes in Europe is the "St. The Way of St. James – El Camino de Santiago". The Camino de Santiago, translated into English, is The Way of St James. It is an ancient network of walking routes across Europe, called pilgrim routes, that meet at the tomb of St James. Since the 1980s, its popularity has been steadily increasing, and the number of pilgrims in 2013 was more than 200,000. Today, it is second only to Jerusalem and Rome in popularity. The pilgrimage "The Way of St. James – El Camino de Santiago" has become a unique event. For most travelers, it is the cheapest way to relax, a good way to get to know the countries, test your physical endurance (since you will have to walk a large part of the way), and meet interesting people, and pray at the churches and monasteries along the way. Many routes lead to this city (Figure 7).[31,32]

The main part of the route passes through the Pyrenees in northern Spain. You can start the journey from Spain, France, Germany, Portugal, Great Britain, or any other country. The most popular is the French Way, which is more than 800 km long. To receive a certificate in Latin for completing the Way of St. James, you must register at one of the churches along the way and walk at least 100 km; if you travel by horse, the minimum distance is 150 km, and for a cyclist, 300 km. Each participant in the journey can receive a pilgrim passport, which will contain special stamps that will serve as a document confirming the journey and will give you certain benefits in all hotels, shelters, churches, and monasteries. In every town and almost every village along the entire route, there are special shelters for pilgrims. Most of the shelters are free if you present a pilgrim's passport. There are also private shelters, where a night's stay costs 8-12 euros. And there are also municipal shelters, where a night's stay costs 3-7 euros – this amount is the so-called donation. Those who wish can also stay in three – or four-star hotels.[33]

It is worth noting that the Camino de Santiago is busier during Holy Years. The next Holy Year is 2027. During Holy Years, pilgrims are entitled to a plenary indulgence, the forgiveness of all sins.

30 Ministry of Education, Science and Youth of Georgia. (2020). Cultural Routes Georgia. The first free mobile application for cultural routes. Available at: <https://www.mes.gov.ge/content.php?id=10495&lang=geo>.

31 Pospisil, R. (2014). The Camino De Santiago: Cycling "The Way". Available at: <https://theprovince.com/travel/camino-de-santiago>.

32 Ibid.

33 Camino Adventures. (2024). The Camino de Santiago Pilgrimage Routes in Spain. Available at: <https://www.caminoadventures.com>.

Figure 8. *The Journey of St. Andrew the Apostle.*

During these years, the Holy Doors of the Cathedral of Santiago have been open to pilgrims.

The "Way of St. James" has been included in the UNESCO World Heritage List and has been declared a "major cultural heritage of the European route".

To walk the Camino is a humbling experience. There were many moments when I thought I had bitten off more than I could chew despite vigorous preparation and training. But I trusted that since God permitted me to be there, He would help me accomplish this objective. He did so, and I thank Him.

The walk to Santiago de Compostela in Northern Spain, the Galician region, is something that I will never forget. The shrine is one of the three major shrines of Christendom, along with Rome and Jerusalem. I have had the good fortune to visit all three.[34]

Researchers have interesting ideas about Fisterra as a "new" final destination for pilgrims. They argue that the modern Fisterra as the end of the journey should be seen as both a result of the post-secular trend in Europe and a response to the fact that the historical destination of Santiago de Compostela is increasingly marked by commercialized mass tourism, which is disadvantageous in the context of pilgrimage.[35]

In the article "The Wrong Way: An Alternative Critique of the Camino de Santiago," the author notes that the 11th-century Camino de Santiago, a spiritual journey to the final resting place of Saint James, has been an important pilgrimage for pilgrims for centuries. Many modern pilgrims try to travel in the same way as in ancient times. However, pilgrims who do not adhere to the perceived "authentic" behavior experience a sense of alienation.[36]

We believe that, if world experience is adapted to Georgian reality and taking into account today's realities, it is entirely possible to implement an international pilgrimage route "The Way of St. Andrew the Apostle" in Georgia, especially if we take into account that St. Andrew traveled several times and this path passes through other countries besides Georgia (Figure 8). According to our research, the countries where Andrew the Apostle traveled are Israel, Turkey, Russia, Belarus, Ukraine, the Baltic States, Poland, Slovenia, Romania, Moldova, Macedonia, Bulgaria, and Greece. (See Figure 8.)[37]

CONCLUSION

In our opinion, with the help of correctly and precisely selected and planned modern PR technologies and marketing, in cooperation with international organizations, the international pilgrim-

34 Frank, V. (2013). Your Camino: Santiago de Compostela. Canada. Available at: <https://caminoways.com/your-camino-santiago-de-compostela>.

35 Blom, T., Nilsson, M., Santos, X. (2016). The way to Santiago beyond Santiago. Fisterra and the pilgrimage's post-secular meaning. European Journal of Tourism Research, Vol. 12. <doi.org/10.54055/ejtr.v12i.217>.

36 Overall, J. (2019). The Wrong Way: An alternative critique of the Camino de Santiago. European Journal of Tourism Research, Vol. 22. Available at: <https://ejtr.vumk.eu/index.php/about/article/view/375/379>; <doi.org/10.54055/ejtr.v22i.375>.

37 Lange's Christian Chronicle. (n.d.). Available at: <https://christian-hx.fyi/andrew>.

age route – "The Way of St. Andrew the Apostle" has great potential.

For the development of religious tourism, we consider close coordination between central and local government bodies – between cultural institutions, healthcare organizations, physical culture and sports, tourism companies, educational institutions, public associations, and religious organizations – essential. This is a complex task, and the state, private, public, and religious institutions should participate in its solution. Only through cooperation will religious tourism have a basis for development and a basis for having a positive impact on cultural and religious dialogue, on the spiritual and economic development of the local population.[38]

To create the desired conditions for the development of religious tourism, it is necessary to:

- form a management mechanism for the development of the tourist direction;
- form a normative-regulatory base for religious tourism to stimulate the mentioned direction and attract investments in this area;
- stimulate business development in the field of religious tourism;
- stimulate the material base for the development of the tourist direction by attracting local and foreign investments – creating new facilities for the preservation and reconstruction of the technical condition of cult architecture as objects of religious tourism;
- create appropriate conditions for the development of tourist zones in the regions of Georgia in the field of tourism; harmonize social and public life, arouse interest in one's own country, resolve issues related to the preservation of historical and cultural heritage, and protection of environmental conditions;
- create and provide an information system for tourists;
- carry out active advertising and information work, which will be aimed at the tourist image of Georgia and the growth of interest in the religious and cultural values of various confessions;
- improve a full-fledged system for the education and professional training of personnel in the field of religious tourism.

Analysis of the history and current state of the development of religious tourism allows us to draw an important conclusion: as a result of the joint and planned work of state, public, commercial and religious organizations, we can achieve that religious tourism will promote mutual understanding and respect between people from different strata of society and representatives of various traditional confessions, different parts of the country, and different countries. This is on the one hand. In addition, it should be taken into account that today the preservation of traditional values, historical and cultural heritage, and their transfer to future generations is one of the priority tasks, which in many cases cannot be solved without the development of tourism, primarily religious tourism.

38 Grdzelishvili, N., Gardapkhadze, T. (2020). Factors of Religious Tourism in Georgia and Its Legal Aspects. Proceedings of the Scientific Symposium "Building Peace through Heritage – World Forum for Change through Dialogue", Florence, March 13-15. Fondazione Romualdo Del Bianco, p. 503.

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Blom, T., Nilsson, M., Santos, X. (2016). The way to Santiago beyond Santiago. Fisterra and the pilgrimage's post-secular meaning. European Journal of Tourism Research, Vol. 12. <doi.org/10.54055/ejtr.v12i.217>;

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Grdzelishvili, N. (2015). The factor of religion in the process of forming the tourist brand of Adjara. VIII International Scientific Conference "Christianity and Economics". Available at: <https://dspace.nplg.gov.ge/handle/1234/487633>. (In Georgian);

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ARTICLE

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OIL SHOCKS, RENEWABLE ENERGY, AND GROWTH REGIMES IN ALGERIA: A Multiple-Threshold NARDL Analysis of CO_2 Emissions

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Abstract. This study employs the MT-NARDL model to examine the nonlinear relationship between economic growth, oil prices, renewable energy consumption, and CO_2 emissions in Algeria over 1980–2024. Allowing GDP per capita to switch across low, medium, and high regimes, the model captures asymmetric short – and long-run responses. The Environmental Kuznets Curve is rejected: no regime yields a significant long-run effect on emissions, evidencing the absence of an automatic decoupling threshold. Renewable energy is the only robust driver of permanent carbon reduction, cutting emissions by 0.155% for each additional 1% share, despite an initial "brown-build" uptick. Oil-price shocks exert merely transitory impacts, whereas medium-growth episodes re-ignite emissions after two years. Error-correction is rapid, yet hydrocarbon dependency persists. Aligning development with climate goals, therefore, requires a coherent policy package that couples accelerated clean-energy deployment, stringent efficiency standards, and economic diversification away from carbon-intensive sectors. By foregrounding regime-dependent asymmetries, the paper offers new empirical evidence for resource-rich economies.

KEYWORDS: ALGERIA, CO_2 EMISSIONS, MT-NARDL, GROWTH REGIMES, RENEWABLE ENERGY, OIL SHOCKS.

INTRODUCTION

The relationship between economic growth and environmental protection has received widespread attention in the economic and environmental literature, as countries seek to achieve a balance between the requirements of development, on the one hand, and the mitigation of environmental degradation, on the other.[1] Economic activities, particularly those related to fossil fuel consumption, are among the main sources of carbon dioxide (CO_2) emissions,[2] placing them at the core of discussions on environmental sustainability. Conversely, renewable energy is emerging as a strategic alternative that contributes to reducing emissions and fostering the transition toward a green economy.[3] At the same time, oil prices remain a key factor shaping the economic and energy trajectories of many countries.[4]

In this context, Algeria is an important model for studying these interactions, due to its heavy reliance on oil and gas revenues as the primary source of GDP.[5] Therefore, per capita carbon dioxide emissions (CO_2 PER) are closely linked to per capita GDP (GDP PER) and global fluctuations in oil prices, reflecting the fragility of the economic structure in the face of external shocks.[6] Nevertheless, integrating renewable energy into the national energy mix is a fundamental step toward reducing the carbon footprint and promoting sustainable development.[7] At the theoretical level, the Classical studies assume a linear relationship between economic growth and environmental degradation.[8] However, empirical evidence reveals more complex dynamics characterized by asymmetry and dependence on different economic systems.[9] For example, rising per capita income may increase emissions at a certain stage of growth, while contributing to their reduction when higher levels are reached as a result of technological advancement and effective environmental policies, which is consistent with the Environmental Kuznets Curve (EKC) hypothesis.[10] In traditional studies, the NARDL model is often employed to analyze asymmetry in economic and environmental relationships by distinguishing between the effects of increases and decreases in the independent variables.[11] However, this approach remains limited as it restricts the analysis to only two regimes.[12]

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2 Lu, F., Ma, F., Feng, L. (2024). Carbon dioxide emissions and economic growth: New evidence from GDP forecasting. Technological Forecasting and Social Change, 205, 123464. <doi.org/10.1016/j.techfore.2024.123464>.

3 Chou, C. H., Ngo, S. L., Tran, P. P. (2023). Renewable energy integration for sustainable economic growth: Insights and challenges via bibliometric analysis. Sustainability, 15(20), 15030. <doi.org/10.3390/su152015030>.

4 Mukhtarov, S. (2024). Oil prices and the renewable energy transition: Empirical evidence from China. Utilities Policy, 91, 101840. <doi.org/10.1016/j.jup.2024.101840>.

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12 Udeagha, M. C., Breitenbach, M. C. (2023). On the

To address this limitation, the MT-NARDL model was developed, allowing GDP per capita to be divided into several regimes at different levels (low, medium, and high).[13] This provides a more accurate understanding of the complex dynamics of the relationship between economic growth and carbon dioxide emissions, while also accounting for the role of oil prices as an external factor and the consumption of renewable energy as a transitional tool towards sustainable development. Therefore, adopting this model is particularly appropriate for the Algerian case and contributes to filling a gap in the literature by offering a comprehensive short – and long-term analysis that links economic growth, energy price fluctuations, and the energy transition in explaining the dynamics of per capita carbon emissions.

The remainder of this paper is organized as follows: Section 1 provides a comprehensive review of the existing literature, Section 2 describes the data and lays out the theoretical framework, Section 3 presents and analyzes the empirical findings, and Section 4 concludes with a summary and policy implications.

1. LITERATURE REVIEW

Recent studies have increasingly examined the nexus between economic growth, energy consumption, and CO_2 emissions using nonlinear and asymmetric models, especially in oil-dependent economies. This literature can be grouped into two main strands: (i) those testing the Environmental Kuznets Curve (EKC) hypothesis across different growth regimes, and (ii) those comparing the effects of renewable versus conventional energy on emissions, with attention to short – and long-run dynamics.

Growth Regimes and the EKC Hypothesis: Several studies have explored whether the EKC hypothesis holds across low, medium, and high growth regimes. Found for South Africa that both energy consumption and income worsen environmental quality, with no EKC evidence.[14] Confirmed the EKC for Nigeria using nonlinear ARDL, showing that growth initially increases emissions but later reduces them.[15] Offered mixed EKC evidence across 25 OECD countries,[16] while rejected it for Korea, finding an N-shaped relationship instead.[17] Supported the EKC for India, noting that oil consumption and price shocks increase emissions, while FDI inflows validate the pollution haven hypothesis.[18]

Renewable vs. Conventional Energy and Oil Price Shocks: The second strand compares energy sources and their asymmetric effects. Found that renewable energy had no significant impact on the ecological footprint in major oil exporters,[19] while showed that renewables initially slow

asymmetric effects of trade openness on CO2 emissions in SADC with a nonlinear ARDL approach. Discover Sustainability, 4(1), 2. <doi.org/10.1007/s43621-022-00117-3>.

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16 Erdogan, S., Okumus, I., Guzel, A. E. (2020). Revisiting the Environmental Kuznets Curve hypothesis in OECD countries: the role of renewable, non-renewable energy, and oil prices. Environmental Science and Pollution Research, 27(19), 23655-23663. <doi.org/10.1007/s11356-020-08520-x>.

17 Koc, S., Bulus, G. C. (2020). Testing validity of the EKC hypothesis in South Korea: role of renewable energy and trade openness. Environmental Science and Pollution Research, 27(23), 29043-29054. <doi.org/10.1007/s11356-020-09172-7>.

18 Sreenu, N. (2022). Impact of FDI, crude oil price and economic growth on CO2 emission in India: – symmetric and asymmetric analysis through ARDL and non-linear ARDL approach. Environmental Science and Pollution Research, 29(28), 42452-42465. <doi.org/10.1007/s11356-022-19597-x>.

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growth but become beneficial in the long run.[20] Confirmed that renewable energy reduces the ecological footprint, whereas natural resource rents increase it.[21] validated the N-shaped EKC for some Asian countries, with renewables reducing emissions and nonrenewables increasing them.[22] found asymmetric effects in Canada: positive shocks in renewables reduce emissions, while negative growth shocks worsen environmental quality.[23] Showed that both positive and negative shocks in renewable energy reduce CO_2 emissions in Saudi Arabia.[24] found asymmetric cointegration in Pakistan, with no significant link between growth and emissions.[25] In a rare study on Algeria, found no EKC evidence: renewables reduce emissions, while growth increases them.

Despite the wealth of previous studies analyzing the relationship between economic growth and emissions, most remain limited by traditional single-threshold NARDL models, which limit their ability to capture nonlinear changes in emissions across multiple growth stages. Most also overlook the impact of recurrent oil shocks on emissions in energy-exporting economies, such as Algeria. Hence, the importance of this study, which fills this gap by applying the multi-threshold MT-NARDL model to analyze the nonlinear and bidirectional causality between growth, renewables, and emissions.[26] highlighted short-run links between renewables, trade, and oil prices in Tunisia.[27] asymmetric interactions between economic growth, oil prices, and renewable energy in explaining CO_2 emissions. This study enhances theoretical and applied understanding of climate transition policies in similar economies.

2. DATA AND THEORETICAL FRAMEWORK

2.1. Data sources

The definitions and measurement units of all variables are presented in Table 1 below.

Table 1. *Model variables and sources*

VARIABLE	SYMBOL	SOURCE
CO2 PER	CO2 emissions per capita (tons)	World Bank
GDPP	GDP per capita	World Bank
OILPRICE	Crude oil price	www.macro-trends.net
REN	Renewable energy consumption (% of total final energy consumption)	World Bank

Source: Author's elaboration based on data from the World Bank and <www.macro-trends.net>

20 Feng, Y., Zhao, T. (2022). Exploring the nonlinear relationship between renewable energy consumption and economic growth in the context of global climate change. International Journal of Environmental Research and Public Health, 19(23), 15647. <doi.org/10.3390/ijerph192315647>.

21 Ullah, A., Ahmed, M., Raza, S. A., Ali, S. (2021). A threshold approach to sustainable development: nonlinear relationship between renewable energy consumption, natural resource rent, and ecological footprint. Journal of environmental management, 295, 113073. <doi.org/10.1016/j.jenvman.2021.113073>.

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23 Erdoğan, E., Serin Oktay, D., Manga, M., Bal, H., Algan, N. (2024). Examining the effects of renewable energy and economic growth on carbon emission in Canada: Evidence from the nonlinear ARDL approaches. Evaluation Review, 48(1), 63-89. <doi.org/10.1177/0193841X231166973>.

24 Toumi, S., Toumi, H. (2019). Asymmetric causality among renewable energy consumption, CO2 emissions, and economic growth in KSA: evidence from a non-linear ARDL model. Environmental Science and Pollution Research, 26(16), 16145-16156. <doi.org/10.1007/s11356-019-04955-z>.

25 Baz, K., Xu, D., Ali, H., Ali, I., Khan, I., Khan, M. M., Cheng, J. (2020). Asymmetric impact of energy consumption and economic growth on ecological footprint: using asymmetric and nonlinear approach. Science of the total environment, 718, 137364. <doi.org/10.1016/j.scitotenv.2020.137364>.

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27 Brini, R., Amara, M., Jemmali, H. (2017). Renewable energy consumption, international trade, oil price and economic growth inter-linkages: The case of Tunisia. Renewable and Sustainable Energy Reviews, 76, 620-627. <doi.org/10.1016/j.rser.2017.03.067>.

2.2. The theoretical framework

2.2.1. MT-NARDL Model

Given the variation in economic policy objectives across the low, medium, and high transition stages, this study employs the MT-NARDL (Multiple Threshold Nonlinear Autoregressive Distributed Lag) model developed by Pal and Mitra (2015, 2016).[28] This model overcomes the limitations of the traditional NARDL framework, which is restricted to two cases: an increase and a decrease, by allowing the variable of interest (GDP per capita) to be partitioned into several regimes at different levels (low, medium, and high).

The MT-NARDL model captures asymmetry by introducing multiple threshold values, enabling the relationship between variables to change according to these thresholds. This feature allows for the analysis of the dynamic relationship between economic growth and carbon dioxide emissions in both the short and long run, while also considering the role of oil prices as an external factor and renewable energy consumption as part of the transition toward sustainability.

To apply the MT-NARDL model in examining the relationship between per capita carbon dioxide emissions (CO_2PER) and economic variables, namely per capita gross domestic product (GDPPER), oil prices (OILPRICE), and renewable energy consumption (REN), we proceed as follows:[29]

- Stage 1: Compute the per capita GDP growth rate by taking the first difference of its logarithm:

$$\Delta GDPP_t = ln(GDPP_t) - ln(GDPP_{t-1})$$

- Stage 2: We determine the threshold values using quantiles:
  - Q_1: represents the lower quantile (e.g., 25%);
  - Q_2: represents the upper quantile (e.g., 75%).
- Stage 3: We construct three regimes (Regimes) for GDPP:
  - Regime 1 (*GDPREG1*): Low GDP per capita growth (less than Q_1):

$$GDPREG1_t = \sum_{i=1}^{t} (\Delta GDPP_j < Q_1) * \Delta GDPP_j$$

  - Regime 2 (*GDPREG2*): Medium GDP per capita growth (between Q_1 and Q_2):

$$GDPREG2_t = \sum_{i=1}^{t} (Q_1 \leq \Delta GDPP_j \leq Q_2) * \Delta GDPP_j$$

  - Regime 3 (*GDPREG3*): High GDP per capita growth (greater than Q_1):

$$GDPREG3_t = \sum_{i=1}^{t} (\Delta GDPP_j > Q_2) * \Delta GDPP_j$$

- Stage 4: Step 4 involves embedding the GDP regimes within the MT-NARDL specification as explanatory variables.

$$CO2_t = \varphi + \theta_1 GDPREG1_t + \theta_2 GDPREG2_t + \\ + \theta_3 GDPREG3_t + \beta X_t + \varepsilon_t$$

Where X represents the explanatory variables, namely (oil, ren), and ε_t is Error term.

- Stage 5: In this stage, dedicated to model specification and estimation, we incorporate the three GDP regimes into the MT-NARDL framework, where the dependent variable is per capita CO_2 emissions (CO_2per). The independent variables consist of oil prices (OILPRICE), renewable energy consumption (REN), along with the three GDP regimes. The model is subsequently estimated using EViews 13 under the general MT-NARDL specification, enabling the identification of the long-run relationship as well as the short-run dynamics through the Error Correction Model (ECM).

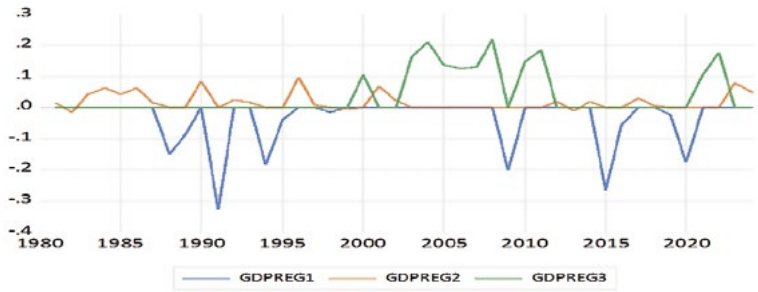
The general form of the MT-NARDL specification can be expressed as:

$$CO2_t = \varphi + \sum_{i=1}^{p} \sigma_i CO2_{t-i} + \sum_{j=0}^{q_1} \gamma_{1j} oil_{t-j} + \sum_{j=0}^{q_2} \gamma_{2j} REN_{t-j} + \\ + \sum_{j=0}^{q_3} \theta_{1_j} GDPREG1_{t-j} + \sum_{j=0}^{q_4} \theta_{2j} GDPREG2_{t-j} + \sum_{j=0}^{q_5} \theta_{3j} GDPREG3_{t-j} + \varepsilon_t$$

28 Gülcü, A. (2025). Essays on financialization, income inequality and growth. <hdl.handle.net/11511/114100>.

29 Georgescu, I., Kinnunen, J. (2025). Nonlinear Effects of GDP Regimes, Renewable Energy, and Urbanization on Finland's Ecological Footprint: An MT-NARDL Approach. World Development Sustainability, 100235. <doi.org/10.1016/j.wds.2025.100235>.

Figure 1. *Representation of the three GDP regimes*



Source: Prepared by the authors using EVIEWS 13

2.2.2. The three GDP regimes in Algeria

Figure 1 represents three different GDP regimes, which in turn reflect the varying stages of economic activity and their impact on environmental variables. The first regime (GDPREG1, low growth, blue line) starts near zero in the early 1980s, then declines to around 2 in the mid-1990s and below 6 by 2020. These negative values reflect periods of economic slowdown, where industrial contraction weakens energy demand and reduces emissions. However, this decline is not driven by environmental policies or efficiency gains, but by financial crises and oil-price volatility, especially after 2000. Thus, emission reductions come at the expense of growth, without achieving sustainable transformation. The second regime (GDPREG2, average growth, orange line) begins close to zero in the early 1980s, rises to about +3 in the late 1990s, and exceeds +5 by 2020. This steady increase is accompanied by rising environmental pressures due to industrial expansion, higher transport activity, and accelerating urbanization. Energy policies during this phase fail to promote efficiency or a shift to cleaner sources, so each additional unit of output directly increases emissions. The third regime (GDPREG3, high growth, green line) starts near +1 in the late 1980s, reaches +4 by 2005, and stabilizes around +4.5 by 2020. The post-2010 plateau suggests that high growth is beginning to generate mitigating effects, possibly through improved efficiency, clean technology adoption, or stricter environmental policies. Nevertheless, since values remain positive, Algeria has not yet fully decoupled growth from emissions. Capitalizing on this trend requires accelerating renewable energy deployment, improving consumption efficiency, and enforcing stricter environmental regulations. Overall, stagnation (GDPREG1) reduces emissions unsustainably, moderate growth (GDPREG2) intensifies environmental pressures, and high growth (GDPREG3) shows early signs of mitigation, but still needs stronger institutional and technological support to ensure a green and sustainable growth path. (See Figure 1.)

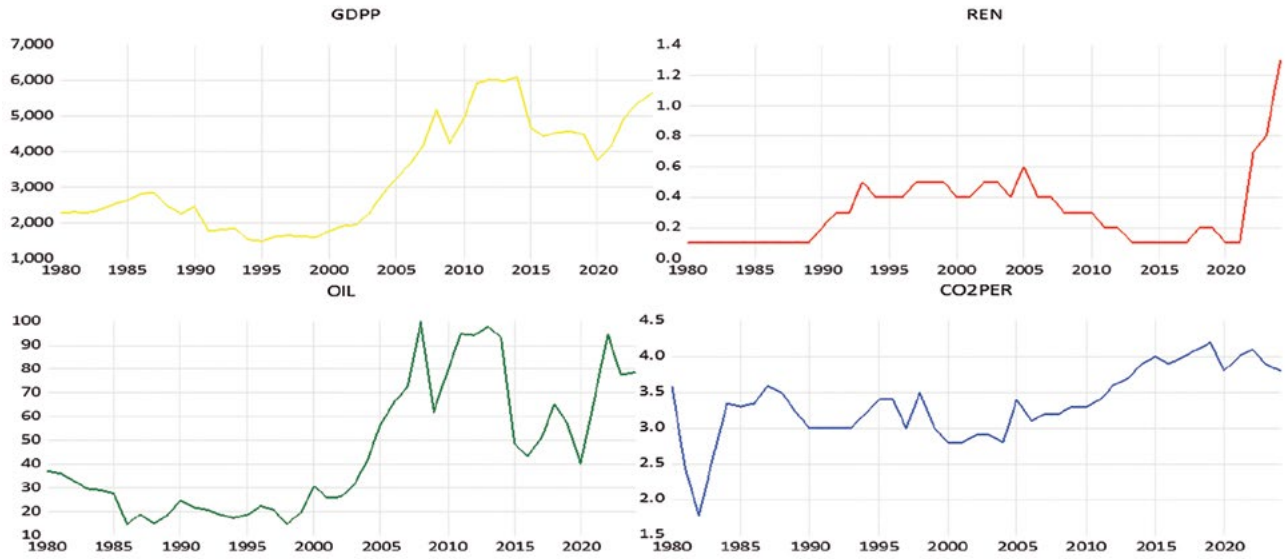
3. EMPIRICAL RESULTS AND DISCUSSION

Before estimating the model, all variables were transformed into their natural logarithms, except for the renewable energy (REN) variable, which is expressed as a percentage. This transformation was applied to reduce variance and to facilitate the interpretation of elasticity coefficients.

3.1. Economic and environmental trends in Algeria during the period 1980–2024

Historically, Algeria's economic growth has been closely tied to oil revenues, with per capita GDP rising sharply during the mid-1980s and again following the oil boom after 2000. However, this growth came at an environmental cost, as per capita carbon dioxide emissions doubled from two to four tons, highlighting the absence of decoupling between economic expansion and environmental impact. The economy remains highly vulnerable to oil price fluctuations, which directly affect financial stability. At the same time, renewable energy consumption remained below 1% until a modest increase after 2019, reflecting only tentative steps toward diversifying energy

Figure 2. *Trends of CO_2 per capita, GDP, renewable energy consumption, and oil prices in Algeria (1980–2024)*



Source: Compiled by the authors

sources and reducing carbon dependence. (See Figure 2.)

3.2. Descriptive statistics

We note from the results in Table 2 that, over the 45-year sample, per capita CO_2 emissions averaged 3.34 tons, with moderate dispersion and an approximately normal distribution. Per capita GDP averaged about US$3,305 but displayed wide variation (±US$1,496), peaking at US$6,095, with a slight right skew. Oil prices averaged US$45.6 per barrel, ranging from US$14.4 to US$99.7, confirming substantial market volatility; their distribution is close to normal. The share of renewable energy was very low, averaging only 0.31% of total final energy use and never exceeding 1.3%. This variable is highly right-skewed and clearly non-normal. (See Table 2.)

Table 2. *Descriptive statistics*

	CO2	GDPP	OIL	REN
MEAN	3.337111	3304.517	45.54800	0.306667
MEDIAN	3.340000	2800.203	35.93000	0.300000
MAXIMUM	4.200000	6094.694	99.67000	1.300000
MINIMUM	1.770000	1466.948	14.42000	0.100000
STD. DEV	0.499070	1496.027	27.62038	0.240643
SKEWNESS	-0.509084	0.469666	0.663165	1.781319
KURTOSIS	3.657191	1.821919	2.060778	7.657819
JARQUE-BERA	2.753559	4.256661	4.952418	64.47686
PROBABILITY	0.252390	0.119036	0.084061	0.000000
SUM	150.1700	148703.3	2049.660	13.80000
SUM SQ. DEV	10.95912	98476247	33566.96	2.548000
OBSERVATIONS	45	45	45	45

Source: Author's calculation

Table 3. *ADF unit root tests*

VARIABLES		INTERCEPT		TREND AND INTERCEPT		NONE	
	Level	First diff	Level	First diff	Level	First diff	Order of Integration
LGDPP	-0.394 (0.901)	-5.598 (0.000***)	-1.419 (0.841)	-5.609 (0.000***)	1.109 (0.928)	-5.521 (0.000***)	I (1)
LCO2PER	− 2.521 (0.117)	− 6.803 (0.000***)	− 4.076 (0.013)	− 6.672 (0.000***)	0.973 (0.909)	− 6.842 (0.000***)	I (1)
LREN	− 1.264 (0.637)	-6.216 (0.000***)	-1.414 (0.842)	6.180- (0.000***)	1.416- (0.143)	-6.160 (0.000***)	I (1)
LOIL	-1.142 (0.690)	− 5.724 (0.000***)	-2.541 (0.307)	− 5.773 (0.000***)	0.238 (0.750)	-5.729 (0.000***)	I (1)

Source: Author's calculation

3.3. Testing the Optimal Lag Lengths for the MT-NARDL Model

Based on the optimal lag model selection criteria using the Akaike Information Criterion (AIC), the MT-NARDL (1,1,3,0,1,2) model was selected as the most appropriate to represent the relationship between the variables under study. This specification indicates that the optimal lag order is: one lag for LCO2, one lag for GDPREG1, three lags for GDPREG2, no lag for GDPREG3, one lag for REN, and two lags for LOIL. The adoption of this model is attributed to its achievement of the lowest AIC value (–2.562876), making it the most statistically efficient compared to the other evaluated models.

3.4. Time Series Stationarity Test

Prior to undertaking time series analysis, it is crucial to assess the stationarity of the data. This requires testing whether the series exhibits a unit root. Accordingly, the Augmented Dickey-Fuller (ADF) test and the Phillips-Perron (PP) test, which are among the most widely applied conventional unit root tests, are employed in this study. The corresponding results are presented in Tables 3-4 below. (See Table 4.)

According to the results of the unit root tests (ADF and PP), all variables were found to be non-stationary at the I(0) level. To achieve stationarity, first differencing was applied. The unit root analysis confirmed that all variables became stationary at the I(1) level, as reported in Tables 3 and 4. These findings enabled us to proceed with the MT-NARDL model. Furthermore, the optimal lag length for the vector autoregressive (VAR) model was determined to be one, as consistently indicated by the majority of lag selection criteria, including FPE, AIC, SC, and HQ. Although the LR test suggested lag four, the convergence of the other criteria supports the choice of one lag as the most appropriate specification for the model under study.

3.5. Bounds of cointegration test

To examine the presence of a long-run equilibrium relationship among the variables, the

Table 4. *PP unit root tests*

VARIABLES		INTERCEPT		TREND AND INTERCEPT		NONE	
	Level	First diff	Level	First diff	Level	First diff	Order of Integration
LGDPP	-0.728 (0.828)	-5.739 (0.000***)	1.708 – (0.730)	-5.745 (0.000***)	0.863 (0.892)	-5.675 (0.000***)	I (1)
LCO2PER	− 2.654 (0.090)	− 7.634 (0.000***)	− 4.280 (0.007)	− 7.515 (0.000***)	− 0.039 (0 .664)	− 7.353 (0.000***)	I (1)
LREN	− 1.264 (0.637)	-6.216 (0.000***)	-1.497 (0.815)	6.180 – (0.000***)	1.416- (0.143)	-6.160 (0.000***)	I (1)
LOIL	-1.138 (0.692)	− 6 .803 (0.000***)	-2.549 (0.304)	− 6.821 (0.000***)	0.352 (0.782)	-6.846 (0.000***)	I (1)

Source: Author's calculation

Table 6. *Results of MT-NARDL cointegration bounds test*

F-BOUNDS			NULL HYPOTHESIS : NO LEVELS RELATIONSHIP		DECISION
Test Statistic	Value	Signif	I (0)	I (1)	
F – Statistic	5.179800	10%	2.276	3.297	Cointegration
K		5%	2.694	3.829	
		1%	3.674	5.019	

Source: Author's calculation

bounds testing procedure was employed. This involved calculating the F-statistic and comparing it against the critical values reported by Pesaran et al. (2001). The corresponding results are presented in Table 6.

The Pesaran-Shin-Smith bounds test (F = 5.18) rejects the null of no cointegration at the 1% level, confirming a stable long-run relationship among CO_2 emissions, growth regimes, renewable energy, and oil prices and justifying the use of the MT-NARDL framework.

3.6. MT – NARDL long-run form

We observe from the long-run MT-NARDL equilibrium equation (1984–2024) that CO_2 emissions move consistently with the explanatory variables (See Table 7.). The error correction coefficient (-0.522) indicates that 52% of any shock is corrected within one year, confirming a relatively rapid return to equilibrium. Renewable energy (REN) emerges as the only significant long-run driver: a permanent 1% increase in its share reduces emissions by 0.155%, underscoring the central role of clean energy investment in mitigation policy. By contrast, none of the three growth regimes exerts a statistically significant long-run effect: the low-growth regime (GDPREG1) shows a positive but insignificant coefficient (0.386), the medium-growth regime (GDPREG2) a negative but insignificant coefficient (-1.596), and the high-growth regime (GDPREG3) a negative but insignificant coefficient (-0.276). This outcome suggests that Algeria has not yet attained the income threshold or structural transformation needed for automatic decoupling. Real oil prices (LOIL) are neutral in the long run (0.049, not significant), reflecting continued dependence on hydrocarbons without sustainable demand-side adjustments. Overall, sustained emissions reductions will require expanding renewable energy, accelerating the shift away from energy-intensive industries, and redesigning growth strategies to move the economy beyond the critical "tipping point" that current GDP regimes have failed to deliver.

Table 7. *MT – NARDL long-run form*

VARIABLES	COEFFICIENTS	STD. ERROR	T-STATISTIC	PROBABILITY
LCO2(-1)*	-0.522053	0.104427	-4.999199	0.0002***
GDPREG1(-1)	0.386290	0.243825	1.584295	0.1248
GDPREG2(-1)	-1.596453	1.428101	-1.117885	0.2735
GDPREG3**	-0.276370	0.224287	-1.232215	0.2285
REN(-1)	-0.154518	0.053845	-2.869678	0.0079***
LOIL(-1)	0.048902	0.033778	1.447765	0.1592
C	0.558038	0.142229	3.923509	0.0005***

, **, * significant at 10%, 5% and 1% level*

Source: Author's calculation

Table 8. *MT – NARDL long-run form*

VARIABLES	COEFFICIENTS	STD. ERROR	T-STATISTIC	PROBABILITY
COINTEQ*	-0.522053	0.078421	-6.657032	0.0000***
D(GDPREG1)	-0.031949	0.116431	-0.274402	0.7855
D(GDPREG2)	-0.061256	0.319199	-0.191906	0.8490
D (GDPREG2 (-1))	-0.371078	0.312073	1.189074	0.2429
D (GDPREG2 (-2))	0.956159	0.307009	3.114431	0.0038***
D(REN)	0.215190	0.066367	3.242420	0.0027***
D(LOIL)	0.033308	0.040134	0.829925	0.4125
D (LOIL (-1))	-0.138120	0.041834	-3.301654	0.0023***
R-squared	0.609830			
Adjusted R-squared	0.527067			
Durbin – Watson stat	1.745274			

, **, * significant at 10%, 5% and 1% level.*
Source: Author's calculation

3.7. MT_NARDL short-run form

The short-run results of the MT-NARDL model, shown in Table 8, reveal that 52% of any departure from the long-run CO_2 path is corrected within one year (COINTEQ –0.522***), underscoring rapid system resilience (See Table 8.). Low-growth (GDPREG1) and current-period medium-growth (GDPREG2) impulses leave emissions unchanged, but the medium-growth impulse delivered two years earlier (GDPREG2(–2)) becomes strongly positive (+0.956**), evidencing a delayed upswing in energy-intensive activity. Renewable-energy deployment (D(REN)) exerts an immediate, positive footprint (+0.215**) as construction and installation phases dominate, an effect that is later reversed by the long-run contraction shown in the equilibrium equation. Oil-price shocks carry no contemporaneous weight (D(LOIL) 0.033), yet a price rise lagged one period (D(LOIL (–1)) significantly dampens emissions (–0.138**) through curtailed fossil-fuel use or brief fuel-switching. These inter-temporal and regime-specific channels highlight the need for flexible policy instruments that anticipate lagged responses, exploit temporary price incentives, and accelerate the point at which renewable infrastructure costs give way to sustained carbon savings.

3.8. Diagnostic Tests

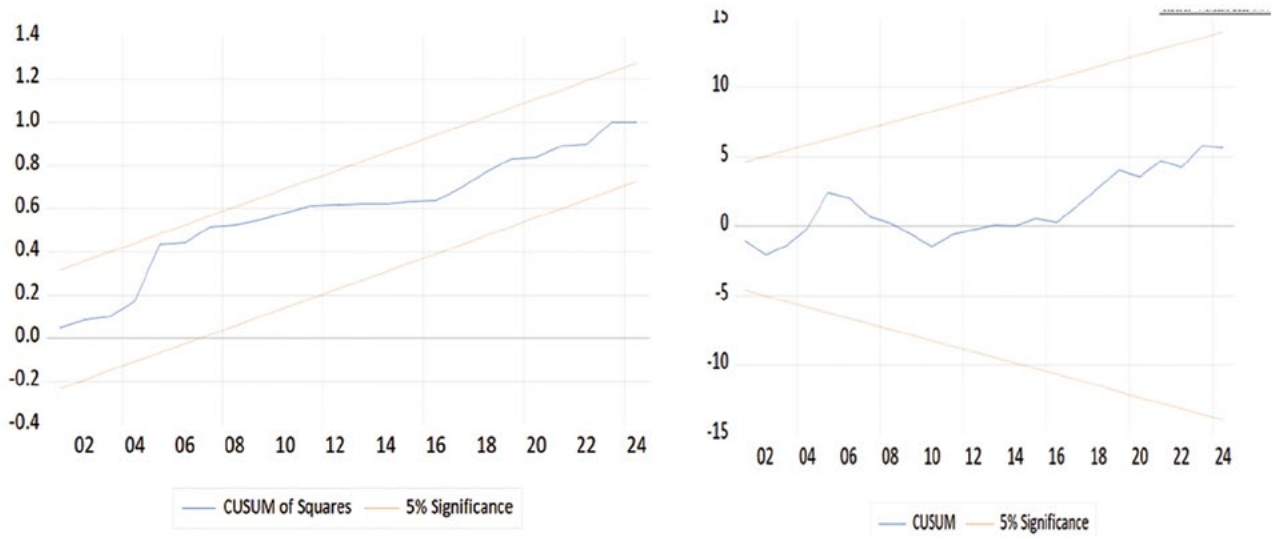
Table 9. *Diagnostic Test Results*

TEST	STATISTIC	P-VALUE	DECISION
Breusch-Godfrey	F = 0.195	0.824	Accept
Breusch-Pagan-Godfrey	F = 1.090	0.407	Accept
ARCH	F = 0.635	0.430	Accept
Jarque-Bera	1.94	0.379	Accept

Source: Author's calculation

We note from the results in Table 9 for the diagnostic tests applied to the MT-NARDL model, including the ARCH test for conditional variance heteroskedasticity, the Breusch-Pagan-Godfrey test for heteroscedasticity, the Breusch-Godfrey test for detecting serial correlation, and the Jarque-Bera test for normality, that the findings confirm the model satisfies the required statistical assumptions. Its validity was established at the 5% significance level across all tests, ensuring the robustness and reliability of the estimated results.

Figure 3-4. *Plot of CUSUM and CUSUM of Squares for coefficients' stability of MT-NARDL model at 5% level of significance.*



Source: Author's calculation

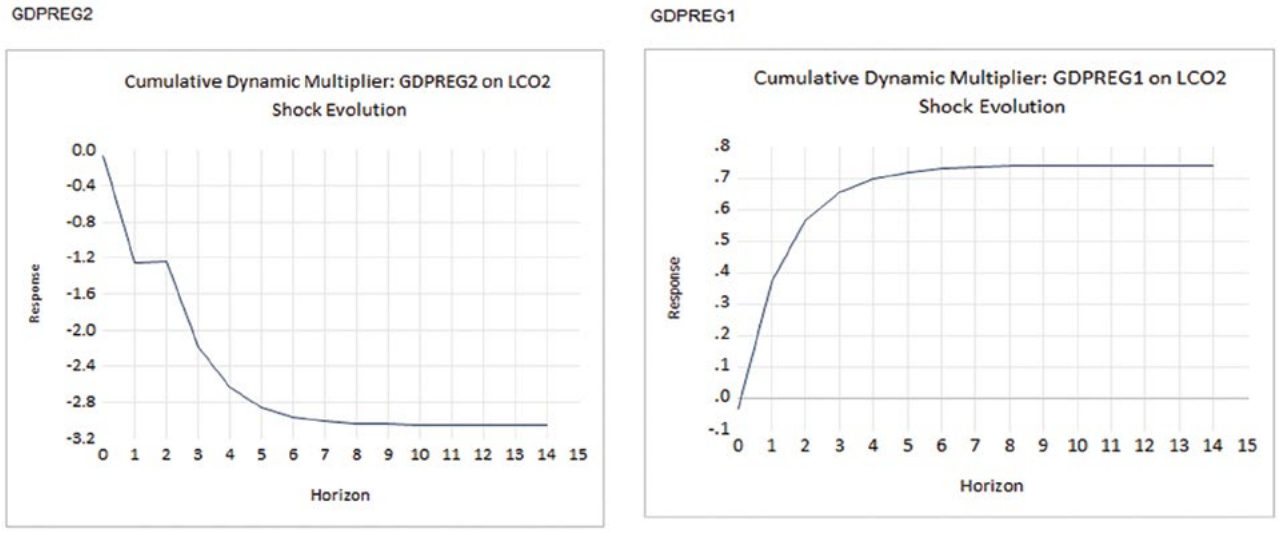
We note from Figures 3 and 4 that the CUSUM and CUSUMSQ tests are used to assess the stability of the model. In the case of Algeria, both statistics remain within the 5% significance bounds, indicating no structural breaks or deviations during the study period. (See Figure 3-4.)

3.9. The cumulative dynamic multiplier

Figure 5 shows that the multiplier of GDPREG1 (low-growth regime) on per-capita CO_2 rises to about 0.7 after five–six years and then stabilises near 0.5. This "recession footprint" reflects the growing carbon-intensity of surviving plants: outdated kilns, furnaces, and vehicles remain in use, maintenance is deferred, and no cleaner capital is adopted, so emissions per unit of GDP edge up even while aggregate output is flat.

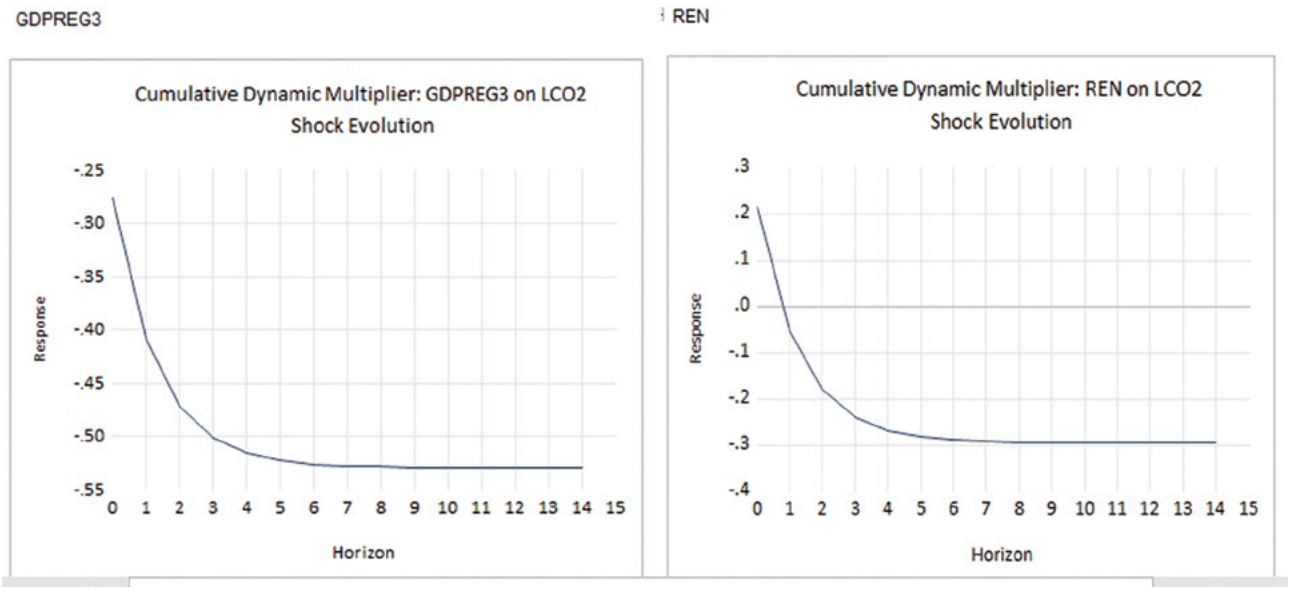
Figure 6 displays the multiplier for GDPREG2 (medium-growth regime); it falls steeply to –2.8 over nine–ten years. Sustained, but not spectacular, income growth finances building retrofits, more efficient industrial boilers, and early solar water-heaters, while tighter standards and subsidy schemes begin to bite. The result is a sizeable

Figure 5-6. *Cumulative dynamic multiplier GDPREG1 and GDPREG2 on LCO2*



Source: Author's calculation

Figure 7-8. *Cumulative dynamic multiplier GDPREG3 and REN on LCO2*



Source: Author's calculation

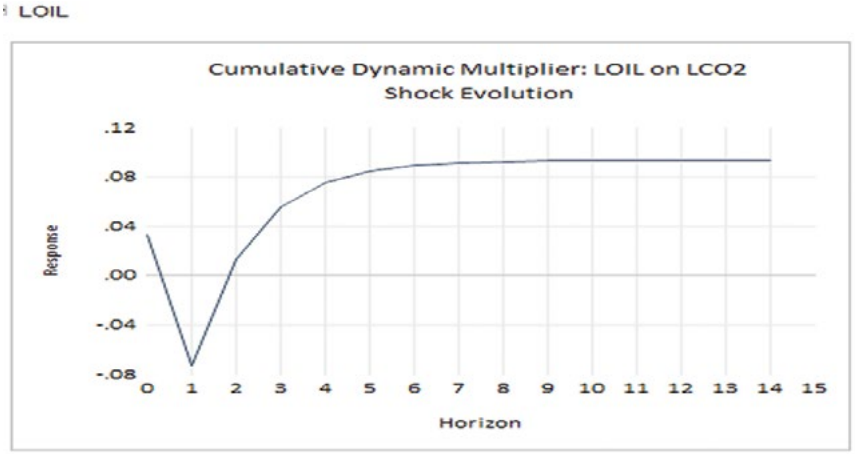
cumulative cut in CO_2 despite continued economic expansion.

Figure 7 plots the multiplier for GDPREG3 (high-growth regime); it oscillates between –0.5 and +0.45 before settling at –0.3. At this stage, the economy can fund green R&D and grid-scale renewables, yet higher disposable income also boosts transport, air-conditioning, and appliance ownership. These offsetting forces yield a near-zero net effect, underscoring that rapid growth alone is insufficient; complementary carbon-pricing or trading instruments are needed to tip the balance decisively downward.

Figure 8 illustrates the multiplier of renewable-energy consumption. It climbs to +0.34 after six–seven years and then plateaus at +0.3, revealing a short – to medium-term "brown-build" phase: emissions embodied in panel, turbine, and transmission-line fabrication outweigh the carbon savings until the new capacity fully displaces fossil generation. Policies that shorten this payback period recycled materials, domestic manufacturing standards, and streamlined permitting, are therefore essential.

Figure 9 traces the multiplier of oil-price shocks. An initial spike to +0.12 is quickly reversed; the curve ends at –0.04. The temporary uptick reflects a drawdown of cheaper, dirtier backup fu-

Figure 9. *Cumulative dynamic multiplier LOIL on LCO2*



Source: Author's calculation

els, while the subsequent decline signals conservation and modal shifts once high prices persist. The overall effect is small, confirming that price cycles must be reinforced by durable clean energy incentives if they are to deliver structural decarbonisation.

3.10. Discussion of Findings and Contribution

The results showed that the relationship between economic growth and carbon dioxide emissions in Algeria goes beyond traditional linear models or the Environmental Kuznets Curve (EKC). It was found to be asymmetric, multi-phased, and dependent on the level of development and energy consumption patterns. Long-run estimates show none of the three growth regimes (low, medium, high) exerts a significant effect, confirming that structural dependence on carbon-intensive sectors and weak green policy have so far prevented any decoupling threshold. Short-run dynamics are more nuanced: medium growth (GDPREG2) turns emission-positive after two years (0.956), whereas high growth (GDPREG3) brings no offsetting relief, revealing the absence of complementary mitigation instruments. Renewable-energy penetration is the only robust lever, delivering a permanent 0.155% cut in CO_2 per additional 1% share, yet it imposes a transitional "brown" bump (+0.215%) as infrastructure is built. Lagged oil-price increases curb emissions (–0.138%), evidencing a temporary behavioral substitution window. Collectively, the results refute growth-only prescriptions and call for an integrated package of renewables scale-up, efficiency gains, and regulatory reform. The study's contribution is (i) empirical documentation of asymmetric, multi-regime impacts, (ii) quantification of short-term renewable-expansion costs against long-term gains, and (iii) disclosure of conditional, delayed responses of oil prices and growth regimes insights, especially pertinent for rentier economies.

CONCLUSION

Algeria represents a suitable case study for examining the nonlinear, multi-stage relationship between economic growth and carbon dioxide emissions. This study employed the MT-NARDL model over the period 1984–2024. The results show that the Environmental Kuznets Curve does not apply, as none of the three growth regimes had a significant long-run effect, reflecting the persistence of carbon-intensive industries and the absence of an inflection point. Renewable energy emerged as the key driver of mitigation: a 1% increase in its share reduces emissions by 0.155% in the long run, despite a temporary rise in the short run due to infrastructure-related costs. Oil prices had no structural impact but showed a short-run negative effect after one year, indicating limited behavioral adjustments rather than a shift in the energy system.

Based on these findings, four policy directions are recommended: (1) restructure the industrial model by reducing reliance on carbon-intensive sectors and integrating energy efficiency into growth strategies; (2) expand solar and wind investments while minimizing their ecological footprint through local manufacturing, recycling, and technology development; (3) channel surplus revenues from high oil prices into financing the energy transition; and (4) diversify the energy mix to gradually reduce dependence on hydrocarbons. Overall, Algeria stands at a decisive crossroads: either maintain its carbon-intensive trajectory or adopt a sustainable development model centered on renewable energy, efficiency, and strong regulatory frameworks.

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ARTICLE

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ISLAMIC BANKING AND ECONOMIC GROWTH: A Bibliometric Analysis of Research Trends (2007-2024)

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Abstract. This article aims to provide an in-depth analysis of the global scientific output on the relationship between Islamic banking and economic growth. Adopting a bibliometric approach, the study covers the period from 2007 to 2024 using data retrieved from the Scopus database, a leading source for tracking academic production. The analysis was conducted with VoSviewer software, which enabled the identification of key research themes, influential authors, countries, institutions, and journals shaping the literature in this area.

The results reveal that Malaysia stands out as the most productive country, followed by other Asian and Middle Eastern economies, reflecting the regional importance of Islamic finance. The findings further highlight an evolution in research focus: while early studies were mainly concerned with the resilience of Islamic banking during the global financial crisis, more recent contributions emphasize emerging issues such as financial inclusion, governance, and sustainability.

Overall, the study demonstrates the diversification of research directions and the growing academic interest in Islamic finance, underscoring its potential contribution to inclusive and sustainable economic development.

KEYWORDS: ISLAMIC FINANCE, ISLAMIC BANKS, ECONOMIC GROWTH, BIBLIOMETRIC ANALYSIS, VOSVIEWER, SCOPUS.

INTRODUCTION

Economic growth is a fundamental metric for assessing the overall performance of national economies. It's intrinsically linked to aggregate productivity, efficient resource allocation, and the achievement of macroeconomic balances in employment, investment, and financial stability. Within this context, the financial sector is seen as a key engine of growth due to its role in financial intermediation, reducing transaction costs, mitigating information asymmetries, and ensuring the efficient allocation of capital.

The banking system holds particular importance within the financial structure, providing mechanisms to mobilize financial resources and channel them toward productive projects. According to finance-led growth literature, a sound banking structure promotes capital accumulation, stimulates savings, and fosters technological innovation, thereby contributing to higher potential growth rates.

However, the 2008 global mortgage crisis highlighted the fragility of the conventional financial system, which is based on traditional lending mechanisms. The uncontrolled expansion of interest-based credit led to a loss of confidence in conventional banking systems, paving the way for alternative financing models based on risk-sharing and a link to the real economy. Within this framework, Islamic finance emerged as a promising alternative, characterized by financing mechanisms based on participation (Musharakah), profit-and-loss sharing (Mudarabah), and cost-plus-profit sales (Murabahah), which makes it more conducive to achieving economic justice and financial stability.

The Islamic finance industry has witnessed significant expansion over the last two decades, driven by high annual growth rates and the emergence of leading Islamic banking models. Data from the Islamic Financial Services Board (IFSB) indicates that the assets of Islamic banks reached $2.1 trillion in 2024, distributed among more than 529 financial institutions, with a clear dominance of Murabahah-based financing.

The recent decades have seen a notable increase in the number of studies exploring the relationship between Islamic banks and economic growth, attempting to test the effectiveness of these tools in achieving sustainable development. However, this growing research momentum highlights the need for bibliometric studies capable of providing a comprehensive overview of the evolution of knowledge in this field and identifying key trends and research schools, as well as mapping knowledge gaps that still require deeper exploration.

From this perspective, this study aims to conduct a bibliometric analysis of scientific research published in the Scopus database during the period (2007–2024) using the VoSviewer software. This study represents a systematic attempt to reconstruct the knowledge map of this research field and provide a solid foundation for researchers and policymakers to guide financial policies toward more equitable, efficient, and sustainable models.

Despite the clear expansion of studies related to Islamic banking, the question remains about the extent of this type of finance's impact on economic growth, especially given the variance in applications and practices across Islamic countries. The diversity in approaches and methodologies, and the disparity in results, necessitate a comprehensive bibliometric analysis to understand the nature and trends of this scientific field. Accordingly, the main research question is formulated as follows: To what extent has scientific output related to Islamic banking and its relationship to economic growth evolved during the period (2007–2024), and what are its main characteristics and trends?

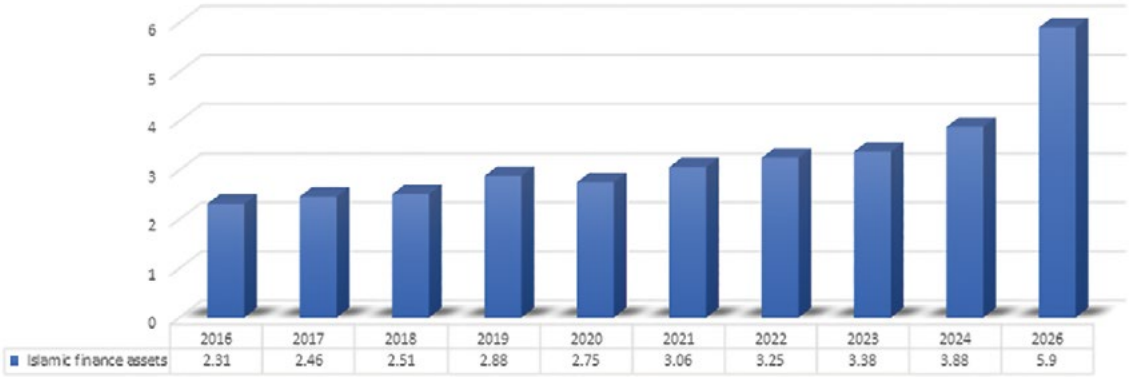
Objectives:

- To provide a quantitative analytical overview of the growth of scientific literature on Islamic banking and economic growth;
- To identify the key players (researchers, countries, institutions) in this research area;
- To explore the main keywords that reflect the interests of scientific research in this field;
- To evaluate the most influential articles based on the number of citations.

Significance of the Study

The importance of this work lies in its treatment of a timely and strategic topic in finance and development. Employing a bibliometric

Figure 1. *Evolution of Islamic Finance Assets (in trillions)*



Source: Author's research based on IFSB reports (2013, 2015, 2017, 2019, 2021, 2023, 2025)

methodology offers a comprehensive picture of research trends, allowing researchers and financial and economic policymakers to understand the accumulated knowledge and direct their efforts toward new research avenues with a tangible impact on the design of sustainable development models.

METHODOLOGY

This study adopts a bibliometric analysis methodology, which is a quantitative approach used to analyze bibliographic data extracted from scientific databases. Its purpose is to evaluate the dynamics of scientific publishing and identify active knowledge networks in a specific subject. The international Scopus database was chosen for its wide coverage and high accuracy in indexing peer-reviewed articles. The VoSviewer software was used to build knowledge networks and analyze keywords, authors, countries, institutions, and citation networks.

1. THEORETICAL FRAMEWORK

1.1. The evolution of Islamic finance

Islamic finance has been proposed as a key solution to conventional financing, especially in Muslim-majority economies, and has demonstrated remarkable growth rates globally.[1] The total assets of the Islamic finance industry were estimated at $3.88 trillion in 2024, representing a 14.9% increase.[2] This financial system is built upon fundamental principles, including profit-and-loss sharing, directing investments towards ethical activities, and asset-backed financing, which requires a deep understanding of operational mechanisms compliant with Islamic Sharia law.[3] [4,5,6,7,8,9,10] (See Figure 1.)

The Islamic finance sector consists of four key components: Islamic banks, Sukuk (Islamic

1 Hanif, M., Zafar, K. (2020). Developments in Islamic finance literature: Evidence from specialized journals. Journal of King Abdulaziz University, 33(2), pp. 3-23. <doi:https://doi.org/10.4197/Islec.33-2.1>.

2 Ifsb. (2025). Islamic Financial Services Industry Stability Report 2025: Need for Coordinated Action to Deepen Markets and Sustain Growth Momentum. Available at: <https://www.ifsb.org/press-releases/islamic-financial-services-industry-stability-report-2025-need-for-coordinated-action-to-deepen-markets-and-sustain-growth-momentum/>.

3 Khamis, F., Isa, M., Yusuff, N. (2024). Perceived inclusion of Islamic finance: The effects of attitudes, experience, literacy, religiosity, and social influences. International Journal of Applied Economics, Finance and Accounting, 18(2), pp. 321-338. <doi: https://doi.org/10.33094/ijaefa.v18i2.1398>.

4 IFSB. (2013). Islamic Financial Services Industry Stability Report.

5 IFSB. (2015). Islamic Financial Services Industry Stability Report.

6 IFSB. (2017). Islamic Financial Services Industry Stability Report.

7 IFSB. (2019). Islamic Financial Services Industry Stability Report.

8 IFSB. (2021). Islamic Financial Services Industry Stability Report.

9 IFSB. (2023). Islamic Financial Services Industry Stability Report.

10 Ibid.

bonds), investment funds, and Takaful (Islamic insurance). These financial instruments are distinguished by their direct link to real economic activity, with most Islamic financial institutions concentrated in Gulf Cooperation Council (GCC) countries, Malaysia, Indonesia, and Pakistan, in addition to their gradual expansion into non-Muslim countries like the United Kingdom and Luxembourg.[11]

1.2. The relationship between Islamic finance and economic growth

The first attempt to document the relationship between finance and economic growth dates to Schumpeter (1911), who highlighted the role of financial institutions in using intermediation to mobilize and allocate funds and record transactions essential for economic development.[12] Since then, economic literature has extensively debated this relationship, whether within the context of conventional or Islamic finance.

Studies on Islamic finance have approached the subject from two perspectives:[13]

- Macro-level: Analyzing the impact of the entire sector on economic growth;
- Micro-level: Examining specific instruments like Murabahah or Mudarabah and their effect on macroeconomic variables.

Empirical results have identified three patterns of relationships between the two variables:

- A bidirectional causal relationship;
- A "supply-leading" relationship, where finance drives economic growth;
- A "demand-following" relationship, where economic growth stimulates finance.

Despite the growing body of literature on Islamic finance and its effect on economic growth, this field still suffers from a lack of coherence, topical integration, and systematic evaluation. Academic contributions remain scattered across various scientific journals, geographic regions, and research traditions, with limited efforts to synthesize findings or trace the chronological evolution of key topics. This highlights the importance of bibliometric analysis as a quantitative methodology capable of providing a holistic view of the research trajectory in this area. It can reveal publishing patterns, identify active knowledge networks, and track recent research trends, thereby enabling researchers and interested parties to form a clearer picture of the future of studies related to Islamic finance and economic growth.[14]

2. METHODOLOGY

Data was systematically retrieved from the Scopus database, a comprehensive and high-quality database for abstracts and citations in the social sciences.[15,16]

The data set creation process involved two main steps:

- Initial Search: A search was conducted on April 1, 2024, using the keywords "banking AND finance AND economic AND growth" on the Scopus platform. This initial query yielded 128 documents published between 1990 and 2024;
- Exclusion/Refinement: To enhance the study's focus and analytical precision, the initial set of documents underwent a strict

11 Loso, J. (2025). Islamic Finance and Economic Growth: A Bibliometric Analysis of Scholarly Contributions. West Science Islamic Studies, 3(3), pp. 240-249. <doi:http://dx.doi.org/10.58812/wsiss.v3i03.2117>.

12 Omar, A., Omer, M. (2022). Testing Effeciency of sudan s Islmic banks for funding socio-economics Development Using World rankings indices. Interational journal of Islamic Economics, 04(01), pp. 1-17.

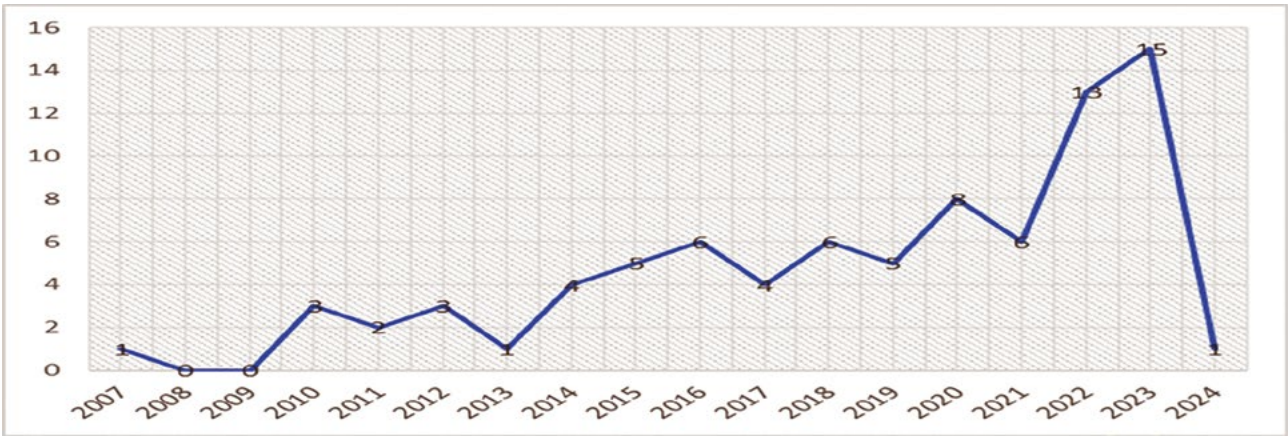
13 Ghorab, H., Others. (2023). The Impact of the Murabaha Formula on Economic Growth: A Standard Study on a Sample of Islamic-Financed Countries from 2013-2020. Journal of Economics and Sustainable Development, 6(2), pp. 20-38.

14 Loso, J. (2025). Islamic Finance and Economic Growth: A Bibliometric Analysis of Scholarly Contributions. West Science Islamic Studies, 3(3), pp. 240-249. <doi:http://dx.doi.org/10.58812/wsiss.v3i03.2117>.

15 Kayani, U. N. et. al. (2023). Examining the Relationship between Economic Growth,Financial Development, and Carbon Emissions: A Review of the Literature and Scientometric Analysis. International Journal of Energy Economics and Policy, 13(02), pp. 489-499.

16 Siti, I. et. al. (2022). Unlocking the Power of Creative Thinking: A bibliometric analysis of the 21st Century. Journal of ASIAN Behavioural Studies (jABs), 7(22), pp. 55-70.

Figure 2. *Number of Articles Published in Scopus from 2007-2024*



Source: Scopus Database 2024

filtering process. This involved limiting the scope to journals in economics, business, and social sciences, and to publications in English only. Furthermore, the search was restricted to research articles, excluding books, conference proceedings, and other non-journal-related document types. As a result of this refinement, the final data set comprised 83 documents, with the publication period narrowed to 2007–2024. It is worth noting that this adjusted timeframe remarkably coincides with the onset of the subprime mortgage crisis.

RESULTS AND DISCUSSION

The curve demonstrates a growing research interest in the topic of Islamic finance and economic growth over the years. The evolution of research can be divided into the following phases (See Figure 2):

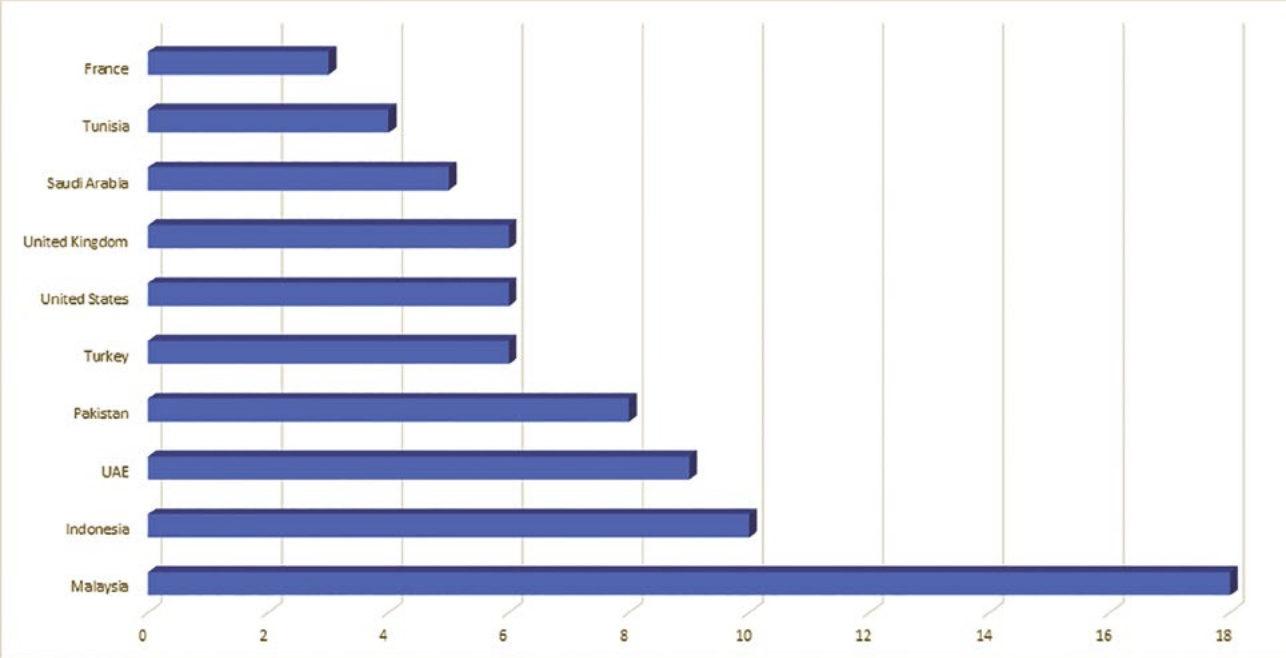
- Inception (2007–2009): Research activity was very limited, coinciding with the beginning of the subprime mortgage crisis. This period marks the initial interest in Islamic finance as an alternative solution to conventional global financing;
- Gradual Growth (2010–2019): A slow and steady increase in the number of articles with minor fluctuations;
- Major Leap and Peak (2020–2023): This period saw a significant rise in publications, peaking in 2023 with 15 articles, indicating a substantial increase in academic interest in this field;
- 2024: Only one article is shown up to April, which does not reflect a decline but rather represents incomplete data for the current year.

The curve shows a general upward trend in the number of publications, which suggests a growing academic interest in this vital field that links Islamic finance and economic growth. Upon examination, it's clear that a few years after the 2008 crisis, there was a gradual increase starting from 2010 and beyond. This rise aligns with the hypothesis that the financial crisis prompted researchers to explore alternative financial models, with Islamic finance being one of them.

Figure 3 shows the countries with the most publications during the study period, revealing centers of power and a significant expansion of intellectual influence in the field of Islamic finance. This reflects the economic and intellectual leadership of this sector. Malaysia and Indonesia are considered global knowledge hubs for Islamic finance. Their dominance (Malaysia with 8 articles, Indonesia with 10) reflects long-term strategies in building a strong financial and legislative infrastructure, along with intensive investment in specialized human capital. This superiority confirms that a conducive economic environment is key to intellectual output.

Emerging countries like Gulf states (UAE, Saudi Arabia), Pakistan, and Turkey have made moder-

Figure 3. *Countries with the Most Publications*



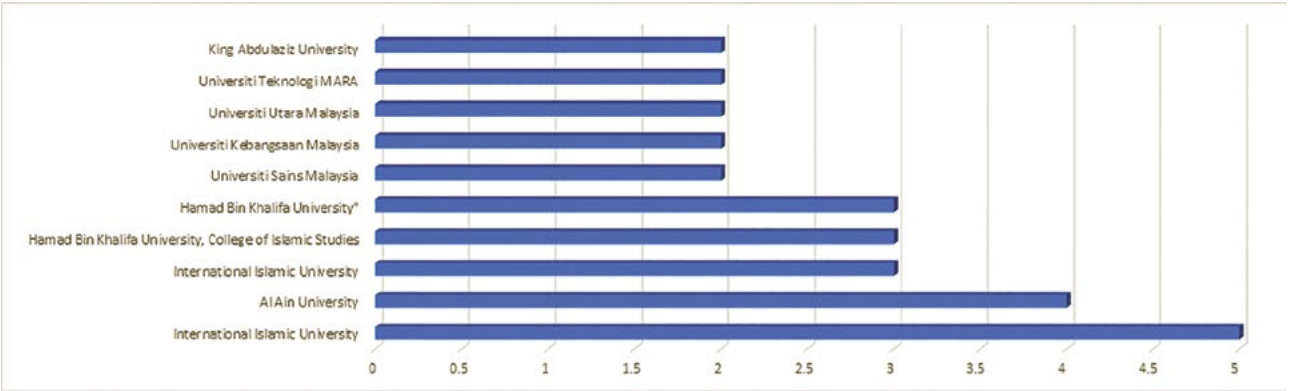
Source: Scopus Database 2024

ate contributions, reflecting an economic evolution that views Islamic finance not just as a religious commitment but as a driver for economic development and financial diversification. The presence of Western countries such as the United Kingdom, the United States, and France, albeit with a small contribution, reflects the transformation of Islamic finance from a local phenomenon into a global economic player. This Western interest is not necessarily religious but is driven by research that explores new market opportunities, giving the topic a global dimension and greater scientific acceptance. (See Figure 4.)

The institutions dominating research on Islamic finance and economic growth can be categorized into two levels:

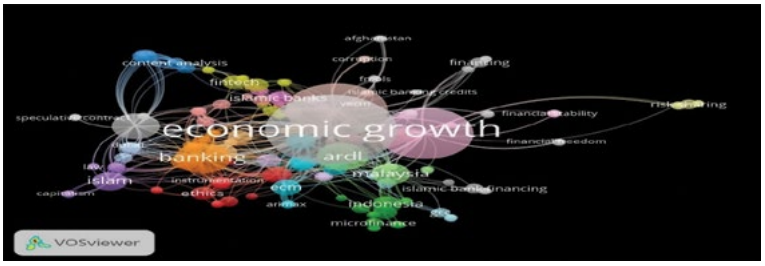
- Geographical Level: Malaysia and Indonesia lead the research landscape, a result of legislative and institutional support for such research. They are followed by an increasing presence from Gulf states (UAE, Saudi Arabia), Pakistan, and Turkey. Notably, the presence of Western countries (France, the United States, and the United Kingdom) confirms the global nature of Islamic finance and its attractiveness as an alternative economic model sought for financial stability, particularly after the 2008 crisis;
- Institutional Level: Leading global Islamic universities emerge as key research

Figure 4. *Most Prolific Institutions in the Field*



Source: Scopus Database 2024

Figure 5. *Keyword Co-occurrence Map*



Source: VoSviewer Outputs

centers, followed by a group of Malaysian universities that reflect Malaysia's commitment to becoming a knowledge hub in Islamic finance. The appearance of Hamad Bin Khalifa University and Al Ain University also indicates a growth in academic research investments in the region to support the Islamic financial sector. (See Figure 5.)

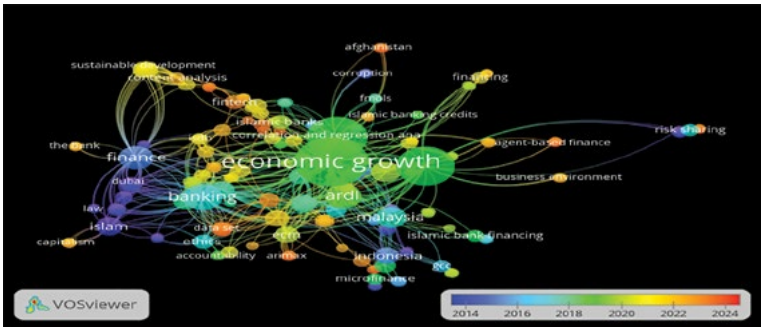
The keyword map provides a strategic overview of the most common concepts in academic research on Islamic finance and economic growth. The map reveals clusters of concepts that can be divided into five main groups, highlighting the methodological evolution and temporal trends in this field:

- Core Concepts: "economic growth", "Islamic banks", and "banking". Economic growth emerges as the largest central node, confirming its status as the core concept for most research. Other key nodes, particularly for Islamic banks, indicate their central role in the relationship with economic growth;
- Methodological Dimensions: Solidifying the Econometric Nature: The light green cluster is the most prominent in giving this subject its rigorous economic and scientific character. The presence of terms like "ARDL", "ECM", "VECM", and "ARIMAX" clearly indicates a widespread adoption of advanced econometric models to study the relationship between Islamic finance and economic growth. These models are more than just statistical tools; they are analytical frameworks that:
  - □ Allow Causal and Dynamic Analysis: Instead of mere correlation, they enable researchers to explore whether Islamic finance leads to economic growth, or vice versa, and whether there are long-term and short-term relationships;
  - □ Address Complex Economic Issues: Such as cointegration and the reciprocal dependence between macroeconomic variables;
  - □ Add Scientific Credibility: The use of these models enhances the strength and generalizability of the results, elevating research from a descriptive level to an analytical and predictive one.

The link between these methodologies and countries like Malaysia and Indonesia confirms that these nations not only contribute to quantitative knowledge production but also to the development and application of modern econometric methods to understand the dynamics of Islamic finance within their economic contexts.

- Core Dimensions of Islamic Finance: Stability and Risk-Sharing: Concepts such as "risk sharing" and "financial stability" emerge as fundamental research components. These concepts are at the heart of the economic principles of Islamic finance. Their connection to economic growth confirms that research explores how the inherent features of Islamic finance can provide a more resilient and sustainable model for economic growth, which has gained particular importance after the global financial crisis.
- Recent Trends and Challenges: Technology and Ethics: Concepts like "fintech" indicate a growing interest in how technological innovations can be integrated into Islamic financial services to enhance efficiency and financial inclusion. Conversely, terms such as "ethics" and "Islam" highlight the normative and value-based dimensions that

Figure 6. *Keyword Analysis Network by Timeline*



Source: VoSviewer Outputs

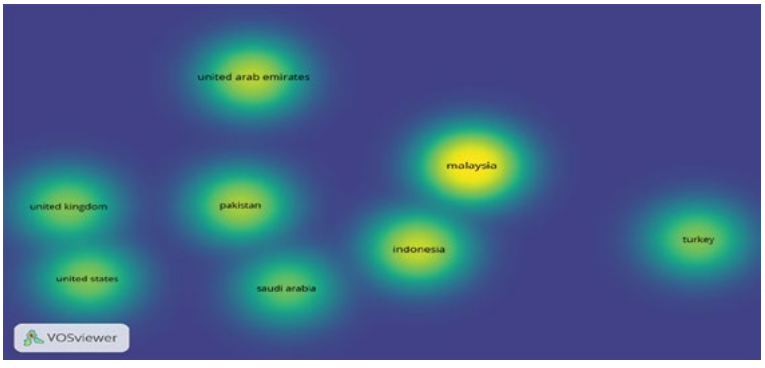
continue to form the foundation of this sector. The concept of "corruption" also appears, possibly as a factor whose impact on the effectiveness of Islamic finance and growth is being studied.

The network map provides a comprehensive picture of a multifaceted research field where "economic growth" is intertwined with "Islamic banks" through sophisticated econometric models. This methodological evolution reflects a concerted effort to lend scientific and quantitative credibility to studies on Islamic finance, moving beyond descriptive analyses to a deep understanding of causal relationships. This integration of robust economic methodologies with Sharia-compliant foundations, in addition to exploring ethical and innovative dimensions, confirms the increasing academic maturity of this field and its role in shaping the future of global financial systems. (See Figure 6.)

This map illustrates the chronological sequence of keywords, colored according to the average year of publication (from blue/2014 to red/2024), providing a comprehensive view of how research interests have evolved and expanded over time. It can be divided into the following phases:

- Phase of Theoretical Foundations and Basic Concepts (in purple and blue): The early period focused on fundamental concepts of Islamic finance and the laws governing it (Islam, law, ethics, finance, banking);
- Linking Islamic Finance to Economic Growth using Economic Theories and Quantitative Models (2017–2019): In this phase, there was an intensive emergence of concepts related to economic development and applied models. This makes research more objective and measurable, giving it a more academic and scientific character and a wider intellectual resonance, especially in Western countries, beyond the religious aspect;
- Phase of Innovation and Sustainability (2020–2024): This phase coincided with the COVID-19 pandemic, which led to a reliance on technology and remote interactions. This introduced modern variables into academic research, such as fintech, which reflects the rapid digital transformation the world wit-

Figure 7. *Density Map Analysis of Active and Influential Countries*



Source: VoSviewer Output

nessed during the pandemic and the drive to enhance the efficiency and financial inclusion of Islamic financial institutions. The term "sustainable development" indicates an increased awareness of climate and the need for sustainable finance. The term "corruption" also highlights an interest in governance standards to increase the effectiveness of Islamic finance. "Risk sharing" and "financial stability" reflect a search for more resilient financial models to face recurring economic and even health-related shocks that could later turn into a financial and economic crisis. (See Figure 7.)

The map highlights the most active and influential areas in terms of scientific output and citations. Malaysia appears as the most active and "hottest" point on the map, shown in bright yellow. This indicates Malaysia's status as a central hub in the research field represented by this network, meaning it has the highest number of publications, is the most cited, and has the highest density of collaborations in this context. Indonesia follows, confirming it is another key center of activity and influence.

The United Arab Emirates shows a very high density, confirming its role as an important research center and an effective bridge between different country clusters. Pakistan also shows high density, reinforcing its role as a key player and an important node in the network.

Medium Density Areas (Green): The United Kingdom and the United States show good density, indicating strong and sustained contributions to the field, even if they are not as "hot" as the Asian hubs. Saudi Arabia also shows good density, confirming its role as a key partner and research center in the region.

Lower Density Areas (Dark Green/Blue): Turkey shows a slightly lower density compared to other countries in the green cluster (Malaysia and Indonesia), but it is still part of an active area.

This density map conclusively confirms that Malaysia and Indonesia are the two driving forces and focal points of research activity in this field. It also highlights the importance of the United Arab Emirates and Pakistan as high-density centers for collaboration and production. This map provides strong visual confirmation of the previous analyses regarding the importance of these countries, especially Malaysia and Indonesia, in contributing the most cited articles in the relevant discipline.

CONCLUSION

This bibliometric study offers deep insights into the dynamic and intellectual evolution in the field of Islamic finance. By analyzing publication patterns, collaboration networks, and geographical activity centers, we were able to draw a comprehensive map of research development.

The results show that the field of Islamic finance has undergone a notable shift in its research agenda, moving from focusing on responses to financial crises to studying its impact on economic growth, and eventually to integrating contemporary issues such as governance, sustainable development, and financial technology. This reflects an increasing maturity in understanding the role of Islamic finance as an active component of the global economic system.

Furthermore, the study revealed the emergence of leading research centers, particularly in Malaysia and Indonesia, which are no longer merely markets but have become key intellectual hubs driving innovation and knowledge production. It also highlighted the role of intermediary countries like the United Arab Emirates and Pakistan in facilitating cross-border collaboration and knowledge exchange.

In conclusion, identifying research gaps, such as the neglect of studying "Islamic windows", not only provides evidence for the need for more specialized research but also opens new avenues for future scientific contributions. This study affirms the analytical value of the bibliometric approach in understanding scientific developments and providing a solid knowledge base for researchers and policymakers to direct research efforts toward issues with a greater impact on comprehensive and sustainable economic development.

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Khamis, F., Isa, M., Yusuff, N. (2024). Perceived inclusion of Islamic finance: The effects of attitudes, experience, literacy, religiosity, and social influences. International Journal of Applied Economics, Finance and Accounting, 18(2). <doi: https://doi.org/10.33094/ijaefa.v18i2.1398>;

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ARTICLE

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THE FAILURE OF REGULATORY IMPACT ASSESSMENT REFORM IN GEORGIA: An Isomorphic Mimicry Perspective

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Abstract. egulatory Impact Assessment (RIA) has been promoted globally as a cornerstone of good governance, designed to ensure evidence-based policymaking and enhance state accountability. In Georgia, multiple international donors supported the institutionalization of RIA from the mid-2000s onward. Despite the enactment of legal and methodological frameworks, the reform did not yield a functioning national system and, by 2024, had effectively collapsed, abandoned by both donors and the government. This paper examines why a globally celebrated instrument failed in an ostensibly favourable context. Using a process-tracing case study of Georgia, the paper employs the concept of Isomorphic Mimicry to show how donor-endorsed reforms can persist as performative compliance – securing resources and external legitimacy – while producing limited outcomes. In this effort, the article showcases how, in parallel with its formal adoption into law, the reform fell into a "capability trap", with civil servants overloaded and donor-driven technical support proliferating. Thus, the case illustrates how mimicry-driven reform can persist for years without achieving substantive results, sustained by a coalition of political actors, donors, and other stakeholders with short-term incentives. The analysis further traces how political-bureaucratic actors preserved prevailing routines by designing and exploiting legislative loopholes that circumscribed RIA's formal effects. This study advances Isomorphic Mimicry and governance reform scholarship by specifying conditions sustaining mimicry (particularly, high donor density, a well-developed system of external and internal reform enablers, and bureaucratic hedging via legislative loopholes), tracing regulatory decoupling that turns RIA into box-ticking, and using Georgia's donor-cooperation suspension as a stress test highlighting the centrality of donors in mimetic reforms.

KEYWORDS: REGULATORY IMPACT ASSESSMENT (RIA), GOOD GOVERNANCE, ISOMORPHIC MIMICRY, INSTITUTIONAL ISOMORPHISM, GEORGIA.

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INTRODUCTION

In the mid-2010s, introducing good governance principles became a priority for the Georgian government and its international development partners (European Commission, 2015; European Commission, 2017).[1] The framework within which Good Governance was to be established in the country was the Public Administration Reform (PAR).[2] The Coordination of the reform was entrusted to the Government Administration, while the unit with direct responsibility became the Department of Policy Analysis and Strategic Planning, established in 2014.[3] In 2015, under the coordination of this same unit, the Public Administration Reform Guide 2020 was adopted, drawing primarily on the SIGMA Principles.[4]

In parallel, by decree of the Prime Minister of Georgia, a strategy governing the activities of the new unit – the Policy Planning System Reform Strategy 2015-2017 (Strategy) – was enacted in 2015. It is noteworthy that, within the situational analysis of the Policy Planning System Reform Strategy 2015-2017, it was stated that the links between policy planning and legislative drafting in Georgia were weak. It was also underscored as a serious problem that Georgia had not introduced a practice of legislative impact assessment. Accordingly, the Strategy envisaged the introduction of a legislative impact assessment system to minimize potential negative effects on citizens, businesses, trade, and investment. It further set the objective that legislative impact assessment should become an integral component of the policy development and decision-making process (Policy Planning System Reform Strategy 2015-2017, 2015). Following this development, starting from 2015, the Regulatory Impact Assessment (RIA) instrument emerged in Georgia within the broader framework of Good Governance and PAR. Accordingly, among the various initiatives launched under PAR, attention has been devoted to the institutionalization of Regulatory Impact Assessment (RIA).[5]

Despite significant efforts and the formal adoption of the relevant law and methodology, the reform never resulted in the creation of a functioning national framework in Georgia. By 2024, the RIA initiative had effectively collapsed, abandoned both by the government and the donors. This experience, therefore, raises a fundamental question: why did a globally celebrated best practice fail so completely even in this favourable context?

This paper addresses that question by presenting a case study of Georgia that applies the concept of isomorphic mimicry (IM), a phenomenon widely discussed in the literature,[6] to explain the failure of the RIA institutionalization reform. Using this illustrative case, the analysis demonstrates how reform – despite broad endorsement and substantial financial support from all relevant actors – can persist for years without delivering substantive outcomes and completely come to a halt after donor activities disappear. The analysis also demonstrates how the Georgian political bureaucracy managed to carry forward its usual modus operandi by further subverting the reform through the creation and exploitation of parallel instruments that limited its formal impact.

1. LITERATURE REVIEW, RESEARCH QUESTIONS, AND METHODOLOGY

I. RIA institutionalization reforms in Eastern Europe and Central Asia

Globally, the process of RIA institutionalization commenced in the mid-2000s when ma-

1 European Commission. (2015). Action document for support to public administration reform in Georgia (PAR); European Commission. (2017). Association agenda between the European Union and Georgia: 2017-2020.

2 The Administration of Government of Georgia. (2015). Public Administration Reform Guide 2020.

3 Initially, when the Government Administration was reviewed under the 2013 OECD/SIGMA assessment, one of the recommendations was to create this new structural unit. (Public Administration Reform Guide 2020, 2015).

4 See: <www.sigmaweb.org/en/publications/the-principles-of-public-administration_7f5ec453-en.html>.

5 USAID – Governing for Growth (G4G) in Georgia. (2015). Recommendations on RIA national framework of Georgia.

6 Andrews, M., Pritchett, L., Woolcock, M. (2019). Building state capability: Evidence, analysis, action. Oxford University Press; Pritchett, L., Woolcock, M., Andrews, M. (2013). Looking like a state: Techniques of persistent failure in state capability for implementation. The Journal of Development Studies, 49(1), pp. 1-18.

jor international organizations introduced this new policy planning tool. Subsequently, relevant standards, frameworks, and guidelines were developed, primarily by organizations such as the OECD, European Commission, World Bank, and other global actors.[7] At its core, RIA aims to foster evidence-based policymaking by ensuring that regulatory decisions are guided by systematic analysis. It seeks to guarantee that enacted regulations are economically rational – assessed through tools such as cost-benefit analysis – coherent with the broader policy framework, and socially as well as culturally acceptable to a diverse group of stakeholders. Thus, the institutionalization of RIA was actively promoted by various donors globally and readily embraced by certain countries seeking to attract donor funding and gain external legitimacy for their reform efforts.[8]

A review of the literature on the institutionalization of Regulatory Impact Assessment (RIA) in Eastern Europe and Central Asia reveals mixed findings. For instance, Staroňová (2010),[9] based on a comparative analysis of five Central European countries, concludes that the forms of institutionalization differ significantly, and the trajectories of reform development vary across countries. She argues that while the existence of high-quality RIA guidelines is an important prerequisite, it is not sufficient for successful implementation. Instead, the quality of oversight mechanisms is identified as a critical factor in determining reform success.

In a later study, Staroňová (2014)[10] examines RIA implementation in Central and Eastern European countries and finds that the preparation of RIA documents tends to be symbolic or non-use in nature. A major problem identified is that when RIAs are conducted, they are often prepared at the final stage of policy formulation, rendering them largely ineffective in influencing decision-making.

Similarly, Shaikenova (2024),[11] in a comparative analysis of RIA implementation in Russia, Kazakhstan, and Georgia, finds that the quality of RIA documents does not improve over time; In fact, it tends to deteriorate. The study concludes that, in the examined countries, RIA reforms are largely superficial and implemented pro forma, with little substantive impact on the policy process.

II. Public administration reform in Georgia

A review of the literature on PAR in Georgia suggests that overall reform outcomes have been moderate and that similar types of problems recur across different reform dimensions. Khuroshvili (2025)[12] argues that the policy-planning system only partially aligns with the SIGMA Principles; Georgia demonstrates relatively strong legislative coherence, yet weaknesses persist in evidence-based policymaking and inclusion. The review also identifies a misalignment between formal institutional design and practical implementation, as well as ongoing challenges related to administrative capacity and limited political will. Kvashilava (2019)[13] concludes that, both with respect to PAR in general and civil service reform in particular, success has largely depended on political will and the broader political context. Comparing the design of the civil service with its actual

7 OECD. (1997). Regulatory impact analysis: Best practices in OECD countries. <doi.org/10.1787/9789264162150-en>; OECD. (2008a). Building an institutional framework for regulatory impact analysis (RIA): Guidance for policy makers. <www.oecd.org/regreform/regulatory-policy/40984990.pdf; OECD. (2008b). Introductory handbook for undertaking regulatory impact analysis (RIA). <http://www.oecd.org/gov/regulatory-policy/44789472.pdf>; OECD. (2015). Regulatory policy in perspective: A reader's companion to the OECD Regulatory Policy Outlook 2015. <dx.doi.org/10.1787/9789264241800-en>.

8 Ibid.

9 Staroňová, K. (2010). Regulatory impact assessment: Formal institutionalization and practice. Journal of Public Policy, 30(1), pp. 117-136.

10 Staroňová, K. (2014). L'institutionnalisation des études d'impact en Europe centrale et orientale [Institutionalization of regulatory impact assessment in Central and Eastern Europe]. Revue française d'administration publique, 149(1), pp. 123-143.

11 Shaikenova, A. (2024). Regulatory impact assessment in Georgia, Kazakhstan, and Russia: Policy learning and policy capacity. Doctoral dissertation, Nazarbayev University.

12 Khuroshvili, B. (2025). The policy planning system in Georgia: design and implementation challenges, Eastern Journal of European Studies, 16(1), pp. 173-193.

13 Kvashilava, B. (2019). The political constraints for civil service reform in Georgia: History, current affairs, prospects and challenges. Caucasus Survey, 7(3), pp. 214-234.

operation, Khuroshvili (2023)[14] and Dolidze (2021)[15] report significant discrepancies in their respective studies. Finally, Abashidze (2016)[16] contends that civil service reform in Georgia was premature; more specifically, the state lacked the capacity to implement a reform of this magnitude effectively, which helps explain its shortcomings.

One might argue that the trajectory of RIA rollout in Georgia mirrors patterns observed both in neighbouring countries' RIA reforms and in Georgia's PAR more generally. More specifically, insufficient political will, limited state capacity, design flaws in institutionalization, and a misalignment between policy design and practical implementation contributed to the reform's shortcomings.

At the same time, given that the reform ostensibly enjoyed full political backing, Georgia's overall governance capacity was comparatively strong, as indicated by the World Governance Indicators (WGI) Government Effectiveness measure, where in 2023 Georgia ranked second after Czechia among Eastern Europe, the South Caucasus, and Central Asia, and the reform had overarching donor support, an essential factor in strengthening state capacity, there may be more at play than the foregoing explanations alone. In other words, the process development under the RIA institutionalization in Georgia may have been deliberate and strategic, with outcomes that in fact reflect the state's intended objectives. To address this question, the author presents a case study of Georgia that applies the concept of isomorphic mimicry (IM), a phenomenon widely discussed in the literature,[17] to explain the failure of the RIA institutionalization reform.

III. What is isomorphic mimicry (IM)?

In line with development literature, there is a global movement where donors typically engage in formulating global themes and their corresponding scripts.[18] Simultaneously, in pursuit of their objectives, donors seek fertile ground, tools, and techniques in various developing countries.[19] Consequently, when a country aims to look like a state and project the image of a successful entity, it often employs the phenomenon/technique of IM. This entails the state's willingness to undertake agenda-confirming reforms to gain internal and external legitimacy, assuming that its shortcomings will be tolerated by external observers (the so-called "successful failures"). Frequently, the IM strategy leads the state to take an excessive burden prematurely (the so-called "premature load-bearing phenomenon"), and ultimately, it becomes trapped in what is known as the capability trap. Escaping this trap and transforming a particular reform into a genuine success then becomes extremely challenging.[20]

The concept of IM builds on the broader notion of institutional isomorphism.[21] DiMaggio and Powell (1983)[22] distinguish three main forms of institutional isomorphism: coercive, normative, and mimetic. As their original models focused on industrial relations, the concept initially belonged more to the field of industrial sociology. By contrast, IM has evolved into an approach more closely aligned with international development.

14 Khuroshvili, B. (2023). Civil Service System in Georgia and its features following the Public Administration Reform. Environment and Society, #8 July, pp. 1-18.

15 Dolidze, N. (2021). Principle of accountability and establishment of politically neutral civil service in Georgia. Paper presented at the 29th NISPAcee Annual Conference.

16 Abashidze, A. (2016). Civil Service Reform in Georgia: Main Directions and Challenges. Doctoral Dissertation, Ilia State University.

17 Andrews, M., Pritchett, L., Woolcock, M. (2019). Building state capability: Evidence, analysis, action. Oxford University Press; Pritchett, L., Woolcock, M., Andrews, M. (2013). Looking like a state: Techniques of persistent failure in state capability for implementation. The Journal of Development Studies, 49(1), pp. 1-18.

18 Ibid.

19 Ibid.

20 For detailed discussion of IM see: Andrews, M., Pritchett, L., Woolcock, M. (2019). Building state capability: Evidence, analysis, action. Oxford University Press; Pritchett, L., Woolcock, M., Andrews, M. (2013). Looking like a state: Techniques of persistent failure in state capability for implementation. The Journal of Development Studies, 49(1), pp. 1-18.

21 DiMaggio, P. J., Powell, W. W. (1983). The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. American Sociological Review, 48(2), pp. 147-160; Powell, W. W., DiMaggio, P. J. (Eds.). (1991). The new institutionalism in organizational analysis. University of Chicago Press.

22 DiMaggio, P. J., Powell, W. W. (1983). The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. American Sociological Review, 48(2), pp. 147-160.

Its practical application expanded particularly in developing countries and their institutions from the late 1980s onward. This shift was largely driven by the growing emphasis on the quality of public institutions within the development discourse.[23]

Andrews et al. (2017) illustrate an organizational ecosystem in which IM is optimal. Precisely, such an ecosystem consists of three layers (ecosystem, organization, and agents). To make IM work effectively, the ecosystem for organizations should be a closed system, and agenda conformity should be a criterion for how novelty is evaluated. The optimal form for organizational legitimisation should be IM, leaders of organizations should choose organizational perpetuation as their preferred strategy, and the so-called frontline workers should act with pure self-interest.[24]

IV. Literature review on IM

The cases of IM have been actively studied academically, both globally but also in the post-Soviet context. For instance, Narzetti & Marques (2021)[25] examine water sector reforms in Brazil and conclude that IM was the main reason for the failure to achieve meaningful success. Similarly, Bano (2022)[26] studies education reforms in Nigeria and argues that the adoption of international best practices facilitated mimicry, enabling the government to signal alignment with global standards without generating real progress. IM is also salient in the implementation of global initiatives. For example, Rubin and Munkholm (2022)[27] analyze the formulation of National Antimicrobial Resistance (AMR) Plans, concluding that in many low – and middle-income countries, the formal adoption of WHO templates occurred without substantive implementation, a phenomenon largely attributed to IM.

In the post-Soviet context, Janenova & Knox (2019)[28] explore the civil service law in Kazakhstan, concluding that the reform process was largely mimicry-driven. Similarly, Janenova (2019)[29] investigates education reforms in Central Asia and identifies widespread adoption of Western models and forms in a mimetic manner. In another study, Knox & Janenova (2019)[30] examine Kazakhstan's E-governance reforms, coining the term "E-Governance Paradox" to describe a situation where digital platforms create a façade of progress. This logic extends to open government reforms, where Kazakhstan's model of "half-open government" is presented as an example of mimicry.[31] Similarly, Kurmanov & Knox (2022)[32] reach comparable conclusions based on the cases of Kazakhstan, Uzbekistan, and Kyrgyzstan. In the realm of higher education, Bischof (2018)[33] examines reforms in Moldova, Russia, and Kazakhstan, documenting a mimetic convergence toward the Bologna Process, which the author refers to as "partial mimicry". In the field of policing strategies – particularly the implementation of the "broken windows" approach in Almaty (Kazakhstan) and Kyiv (Ukraine) – Marat (2018)[34] highlights the mimetic character

23 Andrews, M., Pritchett, L., Woolcock, M. (2019). Building state capability: Evidence, analysis, action. Oxford University Press.

24 Ibid., pp. 32-33.

25 Narzetti, D. A., Marques, R. C. (2021). Isomorphic mimicry and the effectiveness of water-sector reforms in Brazil. Utilities Policy, p. 70.

26 Bano, M. (2022). International push for SBMCs and the problem of isomorphic mimicry: Evidence from Nigeria. RISE Working Paper Series (22/102). Foreign, Commonwealth & Development Office.

27 Rubin, O., Munkholm, L. (2022). Isomorphic dynamics in national action plans on antimicrobial resistance. Public Administration and Development, 42(2), pp. 142-153.

28 Janenova, S., Knox, C. (2017). Civil service reform in Kazakhstan: Trajectory to the 30 most developed countries? International Review of Administrative Sciences, 85(3).

29 Janenova, S. (2019). Public administration academies in Central Asia: "Government puppets" or independent seats of learning? Teaching Public Administration, 38(2).

30 Knox, C., Janenova, S. (2019). The e-government paradox in post-Soviet countries. International Journal of Public Sector Management, 32(6), pp. 600-615.

31 O'Connor, K., Janenova, S., Knox, C. (2019). Open government in authoritarian regimes. International Review of Public Policy, 1(1), pp. 65-83.

32 Kurmanov, B., Knox, C. (2022). Open government and citizen empowerment in authoritarian states. Journal of Eurasian Studies, 13(2), pp. 156-171.

33 Bischof, L. (2018). Effects of the Bologna Process on quality assurance regimes in the post-Soviet space: Isomorphism and path dependencies in Moldova, Russia, and Kazakhstan. In European Higher Education Area: The impact of past and future policies. Springer, pp. 77-93.

34 Marat, E. (2018). Mimicking "broken windows" policing in post-Soviet cities: Expanding social con-

of these strategies' adoption.

Given that IM largely rests on the country and its international partners acting in concert, the next section offers a concise survey of the modalities of interdependence between Georgia and its international counterparts in contemporary Georgian history, spanning the early 1990s through the early 2020s.

V. Georgia as a "Donor Darling"

In the recent history of Georgia, after the fall of the Soviet Union, following the tumultuous experiences of the early 1990s,[35] Georgia, starting in the mid-1990s, began to look outward, seeking models of economic, political, and institutional reform to adopt. Over time, Georgia earned a reputation as a "donor darling", eager to implement various modernist institutional experiments imported from abroad.[36,37]

During Shevardnadze's government period (1992-2003), he sought to utilize pro-Western reform orientations for the purpose of self-legitimization, drawing upon his political background in communism. This effort led to the appointment of young, foreign-educated individuals to prominent positions, making the application of institutional reforms more convincing to international partners.[38] Next, Mikheil Saakashvili, upon assuming power in 2003 and until 2012, also attempted to employ the western reform agenda to bolster his internal legitimacy, portray himself as a western-inspired reform-oriented leader, and thus secure much-needed financial and political support from western partners. However, simultaneously, Saakashvili engaged in local experiments. This occurred when, with the support of international partners, the Saakashvili government pursued reforms that usually conflicted with the standard approaches, recommendations, and conditions typically advanced by donors.[39] Ultimately, the Saakashvili government team faced a significant political setback largely due to these experiments, which extended beyond the basic framework of donor-driven reform agenda conformity and became exceedingly difficult to manage without a strong institutional backbone, external legitimization, and diminishing public support.[40]

trol in uncertain times. Policing and Society, 29(9), pp. 1005-1021.

35 For detailed discussion see: Suny, R. (1994). The making of the Georgian nation (2nd ed.). Indiana University Press; Jones, S. (2023). Georgia: A political history since independence. I. B. Tauris; Shvelidze, D. (2021). Political confrontations and the overthrow of the national government in Georgia (1987–1992). Artanuji Publishing.

36 For detailed discussion see: Christophe, B. (2001). Transformation als Inszenierung – Zur institutionellen und kulturellen Einbettung von Korruption in Georgien. In Höhmann, H.-H. (Ed.). Kultur als Bestimmungsfaktor der Transformation im Osten Europas. Bremen-Temmen, pp. 157-175; Christophe, B. (2005, September 23-24). From hybrid regime to hybrid capitalism? The political economy of Georgia under Eduard Shevardnadze. Conference presentation, University of Paisley; Christophe, B. (2007). Georgia: Capitalism as organized chaos. In Bruszt, L., Roland, G. (Eds.). Varieties of capitalism in post-communist countries. Palgrave Macmillan, pp. 183-200; European Commission. (2022). Evaluation of the EU's cooperation with Georgia: Final report, Volume I – Main report; World Bank. (2012). Fighting corruption in public services: Chronicling Georgia's reforms. World Bank.

37 Christophe called this process an "organized chaos" and compared the process of state transformation to staging.

38 For detailed discussion see: Furusawa, T. (2022). Shevardnadze's paper tiger: A fragile ruling party and the Rose Revolution. Japanese Slavic and East European Studies, 42, pp. 17-34; Chiaberashvili, Z., Tevzadze, G. (2005). Power elites in Georgia: Old and new. In Fluri, P. H., Cole, E. (Eds.). From revolution to reform: Georgia's struggle with democratic institution building and security sector reform. Bureau for Security Policy at the Austrian Ministry of Defense & Geneva Centre for the Democratic Control of Armed Forces, pp. 187-207; De Waal, T. (2019). The Caucasus: An introduction (2nd ed.). Oxford University Press.

39 Engvall, J. (2012). Against the grain: How Georgia fought corruption and what it means. Silk Road Paper. Central Asia-Caucasus Institute & Silk Road Studies Program.

40 For detailed discussion see: Rekhviashvili, L. (2013). Development and the role of the state: Visions of post-revolutionary Georgian government. Caucasus Social Science Review, 1(1), pp. 1-20; Dobbins, M. (2014). The post-Rose Revolution reforms as a case of misguided policy transfer and accidental democratisation? Europe-Asia Studies, 66(5), pp. 759-774; Berglund, C. (2014). Georgia between dominant-power politics, feckless pluralism, and democracy. Demokratizatsiya: The Journal of Post-Soviet Democratization, 22(3), pp. 445–470; Khishtovani, G. (2016). Transformation von Gover-

A new political order was established in Georgia in 2012. This order emerged after the Georgian population managed rather unexpected to change the government through the parliamentary elections in 2012, bringing the Georgian Dream party into power.[41] Retrospectively, we can argue that Georgian Dream lacked an ideological backbone, had no clearly articulated reform agenda, was characterized by inertia, was built fundamentally as the antithesis of the Saakashvili regime, and its governance was characterized by strong elements of informal rule – stemming from the fact that its founder, billionaire Bidzina Ivanishvili, exercised power in an informal capacity.[42] Once this primary goal of becoming a ruling party was achieved, its ideological void became apparent and urgently needed to be filled. Meanwhile, inertia demanded that Georgian Dream demonstrate reform initiatives. However, the short-term orientation of its constantly changing formal leadership made long-term planning virtually impossible (Notably, during the ten-year period of Georgian Dream's governance, from 2012 to 2022, there were six instances where the current prime minister unexpectedly resigned, resulting in the dissolution of the government). These conditions, combined with the signing of the Association Agreement with the EU in 2014 and the assumption of new commitments within the process of Georgia's EU integration,[43] laid the groundwork for presenting so-called good governance reforms as a panacea and provided international donors with an even broader arena for advancing the reform agenda in Georgia.[44] Consequently, the Georgian Dream government exhibited a willingness to undertake agenda-confirming reforms at the expense of foreign donors. As a result, within the governance model, the role and significance of additional actors involved in policy development – primarily multilateral and bilateral donors, as well as the profit and non-profit non-governmental sector closely associated with them – increased and eventually became the dominant feature.

To see the increased scale of international partners' activities in Georgia, several data points can be cited. According to official figures, development partners committed approximately USD 2.3 billion in 2006 and around USD 9.5 billion in 2019, representing a fourfold increase (World Bank, 2025).[45] At the same time, the total funding commitments of the top ten development partners between 2014 and 2021 amounted to approximately USD 14.45 billion. For comparison, Georgia's annual GDP stood at USD 17.9 billion in 2014 and USD 18.4 billion in 2021 (World Bank, 2023).[46] As for the activities of a specific country and organization in Georgia, here, for example, we can look at the work

nance-Strukturen in Georgien, 2003–2012. Verlag Dr. Kovac; Timm, C. (2013). Economic regulation and state interventions: Georgia's move from neoliberalism to state-managed capitalism. PFH Forschungspapiere, 2013/03.

41 For detailed discussion see: Broers, L. (2013). Recognising politics in unrecognised states: 20 years of enquiry into the de facto states of the South Caucasus. Caucasus Survey, 1(1), pp. 59-74; Fairbanks, C. H., Jr. (2004). Georgia's Rose Revolution. Journal of Democracy, 15(2), pp. 110-124; Dobbins, M. (2014). The post-Rose Revolution reforms as a case of misguided policy transfer and accidental democratisation? Europe-Asia Studies, 66(5), pp. 759-774.

42 For detailed discussion see: Kakachia, K., Lebanidze, B., Larsen, J., Grigalashvili, M. (2017). The first 100 days of the Georgian Dream government: A reality check. GIP Policy Report; O'Connor, K., Janenova, S., Knox, C. (2019). Open government in authoritarian regimes. International Review of Public Policy, 1(1), pp. 65-83; Kukava, K. (2022). Democratisation and political transformation in Georgia. In Leontiev, L., Amarasinghe, P. (Eds.). State-building, rule of law, good governance and human rights in post-Soviet space: Thirty years looking back. Routledge; Berglund, C. (2014). Georgia between dominant-power politics, feckless pluralism, and democracy. Demokratizatsiya: The Journal of Post-Soviet Democratization, 22(3), pp. 445-470.

43 Council of the European Union. (2014). Joint press release following the first Association Council meeting between the European Union and Georgia [Press release]; European Commission. (2014). Action document for support to EU-Georgia DCFTA and SMEs.

44 European Commission. (2015). Action document for support to public administration reform in Georgia (PAR); European Commission. (2017). Association agenda between the European Union and Georgia: 2017-2020.

45 World Bank. (2025). The World Bank in Georgia, 2014-2023: Country program evaluation. World Bank.

46 World Bank. (2023). The World Bank in Georgia, 2014-2023: Country program evaluation, approach paper. World Bank.

of the U.S. and the Asian Development Bank. Between 2012 and 2023, the United States disbursed approximately $1.92 billion in Overseas Development Assistance (ODA) to Georgia. On a per capita basis, this represents one of the highest aid levels globally (ForeignAssistance.Gov, 2025; Devdariani, 2025).[47] To understand the scale of assistance, it is also useful to situate Georgia within the regional context of U.S. foreign assistance. In 2022, Georgia ranked second – after Ukraine – in terms of U.S. assistance within the Europe and Eurasia region, which includes a total of 20 countries. This position was held throughout most of the 2012-2022 period. In the case of the Asian Development Bank (ADB), Georgia has witnessed substantial cumulative growth in commitments over the past two decades. While total commitments stood at under USD 200 million in 2006, they had reached approximately USD 2 billion by 2019. By the end of 2021, the total had increased to USD 2.95 billion (The World Bank, 2025).[48]

VI. Research questions and methodology

All the above-mentioned circumstances favoured the introduction and successful implementation of globally recognized good governance practices in Georgia after 2012. Nevertheless, one of the flagship initiatives of this process – the reform aimed at institutionalizing Regulatory Impact Assessment (RIA) – ultimately failed. In this article, we seek to explain the reasons for this failure, employing the IM framework as our theoretical lens. The following research questions will be addressed using a case study:

RQ1: To what extent is Georgia's IM strategy an explanatory factor behind the failure of Regulatory Impact Assessment (RIA) reform?

RQ2: To what extent did donors contribute to the persistence of IM in Georgia?

RQ3: Has the actual governance model deployed any practices, in parallel, to hedge against the risk of dysfunction while mimetic reforms were being implemented?

To answer this question, this article traces the entire RIA institutionalization reform process across four phases: inception, renewed momentum, legislative breakthrough, and rapid decline. The case study draws on a comprehensive review of all relevant documents, supplemented by in-depth interviews and focus groups conducted with various stakeholders involved in the reform process, including its initiators, RIA experts, RIA authors, and policy analysts in Georgia.

2. CASE STUDY – RIA INSTITUTIONALIZATION REFORM IN GEORGIA

The ultimate objective of the RIA institutionalization reform in Georgia was to mandate the Government and Parliament of Georgia to conduct RIAs before the adoption of significant regulatory changes. In the following section, I outline the process of RIA institutionalization and highlight its key milestones.

Phase 1: Inception

The discussion around RIA in Georgia first emerged in 2007 when the Ministry of Economy and Sustainable Development established a dedicated unit, the Division of Economic Policy and Regulation Impact Assessment (KII #1, 2023). During the period from 2007 to 2012, owing to the libertarian approach of the government at the time, the issue of RIA gradually lost its relevance in the following years, despite the continued practice of conducting small-scale on-site assessments (KII #1, 2023). At the same time, capacity building initiatives were sporadically launched for the relevant government units and other stakeholders, including research institutes and consultancy organizations.[49]

Phase 2: The renewed momentum

After a hiatus of several years, discussions about RIA in Georgia regained momentum around 2014-2015. The framework document prepared

47 Devdariani, J. (2025, March). As USAID dies, many of Georgia's "vibrant" CSOs face extinction. GEOpolitics: Journal of Political Commentary in the Caucasus; ForeignAssistance.gov: <www.foreignassistance.gov/cd/georgia/2023/obligations/1>.

48 World Bank. (2025). The World Bank in Georgia, 2014-2023: Country program evaluation. World Bank.

49 USAID – Governing for Growth (G4G) in Georgia. (2015). Recommendations on RIA national framework of Georgia.

by the USAID (United States Agency for International Development) Economic Governance Program (G4G) – Recommendations on RIA National Framework of Georgia – in 2015 was the very first public document discussing the institutional reform framework of RIA in Georgia. As the report notes, before this, RIA in Georgia mainly consisted of ad-hoc events designed to raise awareness among public agencies and enhance stakeholders' RIA-related skills. During the same period, work on pilot RIA documents commenced, with the first three being prepared in 2014. The first official government document to address institutional reform was the "Strategy for the Systematic Reform of Policy Planning (2015-2017)," approved in June 2015. According to this strategy, the government committed to incorporating the RIA methodology into Georgian legislation. The action plan stipulated that this should be achieved no later than 2017, with the Department of Policy Analysis, Strategic Planning, and Coordination of the Prime Minister's Office tasked with developing the reform.[50] Subsequently, the reform process came to a halt for several years. This pause can likely be attributed to the conclusion of the relevant donor-funded project (G4G) and/or a shift in priorities. Specifically, after the development of the corresponding strategic document and the establishment of the designated governmental unit, most probably, donor interest declined, while parallel, the reform lacked the internal readiness to continue. Following this hiatus, around 2017, the reform regained momentum.

Phase 3: The legislative breakthrough

Between 2017 and 2019, two parallel processes unfolded. On one hand, as described above, there was a significant stagnation in terms of institutional reform, with the plans initiated in 2014-2015 largely faltering. On the other hand, a new trend emerged as new donors, such as the USAID Good Governance Initiative and the USAID Energy Program, became more actively involved in the RIA institutionalization process. Various international organizations, including GIZ (German Society for International Cooperation), UNDP (United Nations Development Programme), and UN Women, also took initiatives, contributing to the preparation of pilot RIA documents and strengthening the relevant human resources. Notably, 2019 witnessed the highest number of prepared RIA documents, with 12 in total.[51]

The events of 2019-2020 mark a critical stage in the RIA institutionalization reform in Georgia. In May 2019, the Parliament of Georgia approved amendments to the Law on Normative Acts. These amendments mandated attaching an RIA report to draft normative acts, but it's worth noting that the legislative amendment already defined exceptions, allowing initiators to bypass RIA preparation. Another significant date was January 17, 2020, when Government Resolution 35 and related annexes were approved. These documents established the methodological framework for RIA implementation and outlined a list of legislative acts requiring mandatory RIA inclusion when drafting amendments. It's essential to acknowledge that various donors played a substantial role in initiating and technically supporting this process (KII #2, 2023).

RIA's experts note that, alongside the active engagement of donors, a significant driver of change was the prevailing trend of governmental reforms at the time. As one former public official remarked during a focus group discussion, there was both hope and an expectation among the officials driving the reform that, when a reform-minded minister eventually assumed office, they would encounter, on the one hand, an established legislative framework and, on the other, a well-prepared civil service (FGD #1 with RIA-experts, 2023).

Phase 4: Initial euphoria and sudden decline

The final phase of the RIA institutionalization reform began with initial euphoria but ended in a sudden decline.

The euphoria followed a legislative breakthrough, as stakeholders were eager to advance policy implementation and actively sought to establish an optimal institutional framework to ensure its effectiveness. During the period of 2021-2023, several significant processes have occurred. Elements of the RIA institutionalization reform were incorporated into strategic documents and action plans. More specifically, in 2022, the ap-

50 Ibid.

51 ISET Policy Institute. (2023). RIA institutionalization reform assessment report.

proval of the 2023-2026 Public Administration Reform (PAR) strategy featured an entry concerning RIA. Notably, this reference is somewhat vague and primarily focuses on the retraining of civil servants. Interestingly, the strategy attempts to justify the relatively slow progress of RIA reform by citing the global pandemic. Also, the SME Development Strategy 2021-2025, adopted in 2021, places a strong emphasis on legislative development, institutional strengthening, and the enhancement of the operating environment. Within this framework, the strategy supports the development of the RIA system, which includes the implementation of the RIA SME test for legislative changes, with consideration given to EU and international best practices.

At the same time, various implementing units responsible for the RIA institutionalization reform were established and strengthened. Notably, alongside the process of RIA institutionalization, there was an ongoing effort to strengthen RIA-related skills. However, on the one hand, there was no comprehensive overview of the skills that civil servants have been able to enhance during this period.[52] On the other hand, all relevant stakeholders were concerned about the lack of human resources and the constant outflow of personnel from the public service, which hinders the achievement of reform goals (KII #1, 2023; FDG #2 with RIA-authors, 2023). They consistently emphasized the importance of continued donor support for capacity-building programs.[53] Consequently, at the legislative level, it was determined that the Parliamentary Secretary of the Government of Georgia (Secretary) would oversee the study of draft laws and the attached RIA reports, assessing their quality. With support from the USAID EG Program, a decision was made to establish the RIA Support Platform at the Secretary (the host organization). Under this platform, when the state agency identifies the need for the RIA preparation and receives appropriate support, it can request assistance from the Secretary. The Secretary then engages RIA experts affiliated with the platform. The program identified three experts for this purpose. One of these experts was responsible for determining the extent of assistance required for RIA preparation, the type of RIA to be implemented, and the nature of the support provided. From May 2022 to August 2023, within the platform's activities, RIA experts participated in the preparation of a single RIA report. In 2023, work was underway to draft the second RIA document.[54]

The second initiative, supported by the USAID EG Program and the Secretary, was the RIA Peer-review Platform. In the initial stage, the program developed the concept and structure of the quality control platform. In 2023, the RIA report quality control guidebook was created, aligning with the RIA preparation methodology defined by government decree. The plan was for this document to become informally mandatory during RIA quality assessments. The USAID EG program was planning to assist the office by providing expert support. The initiative involves two independent experts and one government representative assessing the quality of the RIA document.[55]

Parallelly, in 2022, the Research Center of the Parliament of Georgia expressed its willingness to contribute to RIA institutionalization reform. Consequently, in 2023, its mandate was expanded following relevant changes in the center's statute, preparing RIA-related documents as part of the center's responsibilities. The Parliamentary Budget Office expressed similar interest, particularly in enhancing skills related to the Cost-Benefit Analysis (CBA) methodology.[56] Additionally, there is the Economic Policy and Regulation Impact Assessment Division, which operates as a structural unit of the Economic Policy Department within the Ministry of Economy and Sustainable Development. In 2023, with active participation and funding from UNDP, there was an initiative underway to prepare the SME Test methodology and implement it in practice.

The changes outlined above were accompanied by the introduction of new methodologies, guidelines, and regulatory initiatives associated with the RIA institutionalization reform. These included the completion and refinement of various methodologies – such as the RIA methodology

52 ISET Policy Institute. (2023). RIA institutionalization reform assessment report.

53 Ibid.

54 Ibid.

55 ISET Policy Institute. (2023). RIA institutionalization reform assessment report.

56 Ibid.

(pursuant to Government of Georgia Resolution No. 35), the standard and in-depth RIA methodologies, the SME test methodology, and the RIA quality assurance methodology/guidebook. In addition, a number of guidebook-style documents were prepared, including publications on cost-benefit analysis developed specifically by the Parliamentary Budget Office. Moreover, several new regulatory initiatives were launched within the framework of the RIA institutionalization reform. A notable example was the RIA Implementation Expert Certification, presented by industry experts at the USAID EG event in March 2023.

The initiatives described above were unexpectedly suspended in 2024. More concretely, following the Georgian government's confrontation with the European Union and the United States in early 2024 – during which it accused them, among others, of orchestrating a revolution in Georgia – the EU and the U.S. responded by suspending cooperation with public institutions under their donor-funded initiatives.[57] As a result, the RIA reform in Georgia effectively came to an end. All donor initiatives were halted, and public institutions ceased their independent engagement in the reform process.

3. RESULTS

In response to RQ1, the process-tracing analysis leads us to a finding that the institutionalization of the RIA reform in Georgia followed the inherent logic of the IM framework. Georgia was initially unprepared for the significant burden it assumed (the "premature load-bearing phenomenon"), which gradually led the public service into a capability trap. For instance, the inclusion of RIA-related issues in state strategies and action plans, the expansion of the mandate of existing units, the development of new methodological approaches and relevant guidelines, and the initiation of other regulatory innovations have laid the foundation for an irreversible process of deepening the skills gap in the public service (for instance, in this case study, the initiative to assign the task of RIA quality control to the employees of the Office of the Parliamentary Secretary of the Government of Georgia placed a significant institutional burden on the office (FGD #1 with RIA-experts, 2023). This has made their daily work more challenging and the reform implementation process less likely to succeed. At the same time, for the public service to escape this capability trap into which it had placed itself – and to fulfil all the commitments it had undertaken at the normative level – it required ever-increasing and continuous donor support. In response, both donors and technical assistance providers (private/non-governmental organizations, individual experts) were eager to offer new services, and as described above, they continuously developed new initiatives and tools for this purpose. From a theoretical perspective, this implied that escaping this trap and making a particular reform successful became nearly impossible.

To further illustrate the mimicry nature of the reform, it is instructive to examine its outcomes. Following the significant changes adopted at the beginning of 2020, by September 2023, the Georgian government had not submitted a single RIA report to the Parliament of Georgia regarding changes initiated in the laws determined by government decree.[58]

Regarding RQ2, the mimicry-based nature of the reform and its total dependence on donor engagement became evident in its de facto termination: once donor initiatives were halted in 2024, public institutions completely ceased their independent engagement in the RIA institutionalization process. As a result, the RIA reform in Georgia effectively came to an end.

In response to RQ3, it is noteworthy that the reform failed to affect the current governance model; alongside the formal endorsement of the reform, the political bureaucracy managed to maintain the usual modus operandi by creating and leveraging various regulatory tools. This was achieved through legislative initiatives that created so-called legislative loopholes. To illustrate, the initial legislative change allowed bills initiat-

57 For details see: Radio Free Europe/Radio Liberty. (2024, July 9). EU halts Georgia's accession to the bloc, freezes financial aid over much-criticized law; Politico. (2024, November 30). US suspends strategic partnership with Georgia after EU membership talks halted. Politico.

58 ISET Policy Institute. (2023). RIA institutionalization reform assessment report.

ed by parliamentarians to bypass the mandatory use of RIA. The decree also includes a provision stating that, under certain circumstances, delays in legislative changes are considered unjustified, and therefore, the preparation of a RIA is not required for such changes. In practice, those loopholes have become an important mechanism for implementing regulatory changes outside the formal scope of the reform. According to an analysis conducted by ISET-PI in 2023, between 2022 and September 2023, three such legislative initiatives were introduced by ruling party parliamentarians (In a KII #2, RIA expert aptly referred to these initiators as "volunteer parliamentarians"). In an additional three cases, the Government of Georgia justified the absence of RIA by citing the lack of justification for the delay. As one of the focus group participants clearly stated, whenever an initiative of importance to the government was at stake, it was implemented through exceptions, bypassing the RIA process (FGD #1 with RIA-experts, 2023).

CONCLUSION

Using the example of Georgian RIA institutionalization reform, we can conclude that a classical type of IM can be observed. It was characterized by the following:

- Firstly, all relevant stakeholders contributed to the viability and sustained perpetuation of mimicry-driven reforms, despite the lack of substantive results. Specifically: 1) Within the political bureaucracy, there was a continued formal endorsement of the reform process; 2) Donors continued to advance the reform process, thereby contributing to its de facto legitimization. 3) Opportunism was displayed by the reform implementers, both at the institutional (at both the state and private) and individual levels, aligning with their own interests. In some cases, this involved staying engaged in the reform process to maintain, strengthen, or assign a formal purpose to the respective institution. In other cases, it involves pursuing individual benefits. More specifically, in exchange for short-term benefits, technical supporters of the reform, such as experts, consulting groups, and research centers, often unknowingly facilitated the acceleration of the IM process;
- Secondly, the reform gradually led the public service into a capability trap, from which escape required ever-increasing and continuous donor support;
- Thirdly, in the absence of an exogenous shock – specifically, the abrupt discontinuation of donor initiatives in cooperation with state entities in Georgia in 2024 – there was a strong likelihood that the mimicry-driven reform process would have persisted indefinitely, sustained by the active contribution of all relevant stakeholders.

At the same time, the suspension of activities by relevant international donors in Georgia effectively created a natural experiment – specifically, the opportunity to assess the extent to which the reform could prove sustainable in the complete absence of donor support. In other words, what was the scale of IM within the framework of the reform? The outcome was clear: once donor initiatives ceased, public institutions entirely discontinued their independent engagement in the RIA institutionalization process. Consequently, after donors abandoned the process, the RIA reform in Georgia effectively came to an end.

Simultaneously, the RIA institutionalization reform has revealed the existence of an effective political bureaucracy within the Georgian governance model and its systemic response to IM. This became evident when, during the ongoing reform, the previously unforeseen risk of transitioning from IM to significant systemic changes emerged. It demonstrated the ability of the system to accurately perceive the risks of IM and react accordingly to prevent systemic collapse. Precisely, parallel to a continued formal endorsement of the reform process, a de facto imitation of reform through the exploitation of various legislative loopholes took place, designed to prevent it from producing substantive results. This dual strategy ensured that the reform did not disrupt the stable functioning of the existing governance model.

This study advances scholarship on Isomor-

phic Mimicry and governance reforms in three respects. First, it specifies the organizational and ecosystemic conditions under which Isomorphic Mimicry is sustained – high donor density, a well-developed system of external and internal reform enablers, and bureaucratic hedging via legislative loopholes. Second, it identifies concrete mechanisms of decoupling in the regulatory domain, turning RIA from a real decision-making instrument into a box-ticking exercise. Third, methodologically, the analysis exploits an exogenous suspension of donor cooperation in Georgia as a stress test, delineating the significance of donor engagement within a mimetic reform framework.

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GENDERED ROLES AND FAMILY WELL-BEING IN GEORGIA: A Culturally Embedded Analysis for Intercultural Family Research

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Abstract. This study explores the interplay between empathy, cooperative conflict resolution, and marital satisfaction within the framework of culturally embedded gender roles in Georgian families. Situated in the context of Georgia's post-Soviet transformation, the research examines how traditional responsibilities assigned to mothers and fathers influence emotional dynamics and family well-being. Drawing from intercultural psychology, the study considers how cultural scripts, interdependence-oriented norms, and shifting gender expectations affect marital functioning across two life stages. Quantitative analysis reveals that women report higher empathy and collaborative conflict strategies, which correlate positively with marital satisfaction. Additionally, maternal perceptions of support significantly influence children's well-being and fathers' emotional engagement. These findings contribute to cross-cultural psychology by highlighting how family dynamics are shaped by cultural continuity and value shifts in transitional societies.

KEYWORDS: INTERCULTURAL FAMILY DYNAMICS, GENDER AND CULTURE, CROSS-CULTURAL PSYCHOLOGY, POST-SOVIET CULTURAL TRANSFORMATION, CULTURAL VALUES AND PARENTING.

INTRODUCTION

The well-being of a family is shaped not only by individual and interpersonal dynamics but also by the ontological structures that define gender roles within a given society. Traditional family structures, particularly in Georgia, have long assigned distinct responsibilities to husbands and wives, influencing marital satisfaction, conflict resolution, and parental engagement. However, these roles are not merely socially prescribed behaviors but also ontologically significant categories that shape individual identity and family dynamics.

Many factors influence family well-being, and their impact varies. For instance, parental conflict is crucial to understanding family dynamics, as it affects children's development and family health.[1] Cummings, Taylor, and Merrilees (2020)2 emphasize the importance of reducing interparental conflict to foster positive family dynamics. Effective communication, trust, and mutual support are essential for emotional stability.[3] Economic security also plays a role in family well-being by reducing stress and uncertainty,[4] with positive perceptions of financial stability improving family dynamics.[5] The association between family functioning and children's emotional outcomes highlights the moderating role of parental mental health.[6] Child well-being often reflects family health and cohesion, including emotional, academic, and social aspects.[7] Marital satisfaction, influenced by communication, emotional support, empathy, conflict resolution, and financial stability, is another key determinant of family well-being.[8]

As we can see, family well-being is influenced by various factors, including parental conflict, social support networks, access to resources, community environments, and cultural norms. It is dynamic and can fluctuate based on life events, changes in relationships, and external stressors. Furthermore, the distribution of family roles, the effectiveness of family functioning, and the ability to cope with challenges are significant.[9] The nature of parental relationships is crucial; conflicts can severely deteriorate family well-being, while their absence fosters stability for both children and parents.[10]

1 Don, B. P., Roubinov, D. S., Puterman, E., Epel, E. S. (2022). The role of interparental relationship variability in parent–child interactions: Results from a sample of mothers of children with autism spectrum disorder and mothers with neurotypical children. Journal of Marriage and Family, 84(5), pp. 1109-1126. <doi.org/10.1111/jomf.12852>.

2 Cummings, E. M., Taylor, L. K., Merrilees, C. E. (2020). Evaluating parenting programs aimed at reducing interparental conflict: Implications for family well-being. Journal of Family Psychology, 34(3), pp. 297-307.

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8 Kamo, Y. (1993). Determinants of marital satisfaction: A comparison of the United States and Japan. *Journal of Social and Personal Relationships*, *10*(4), pp. 505-520. <doi.org/10.1177/0265407593104005>.

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10 Don, B. P., Roubinov, D. S., Puterman, E., Epel, E. S. (2022). The role of interparental relationship variability in parent–child interactions: Results from a sample of mothers of children with autism spectrum disorder and mothers with neurotypical children. *Journal of Marriage and Family, 84*(5), pp.

Gender significantly influences family dynamics. Gottman and Levenson (1992)[11] found that wives are more emotional and defensive in marital conflicts, often initiating them, while husbands tend not to defuse situations. In successful marriages, women handle conflicts constructively, encouraging attentiveness from men. However, Zhu et al. (2022)[12] argue that these factors vary across cultures, highlighting the need for research in specific contexts like Georgia.

In Georgia, a post-Soviet country with unique social values, gender roles shape family dynamics. Women are typically the primary caregivers, responsible for emotional labor and child-rearing, while men are seen as financial providers.[3] Rising divorce rates reflect dissatisfaction with women's roles, linked to post-Soviet changes that expanded economic opportunities for women. This shift has contributed to changing gender roles, reduced parental empathy, and family instability, particularly in middle age.[4]

While grounded in the Georgian cultural context, this study contributes to intercultural family psychology by examining how gendered roles function within a transitional society. Georgia's post-Soviet transformation and evolving gender norms create a unique environment where traditional family expectations are renegotiated alongside modern influences. Compared to individualistic societies like Western Europe or North America, Georgian families often maintain hierarchical, role-specific structures rooted in collectivist traditions. This analysis complements cross-cultural studies, such as Kamo's (1993)[5] comparison of marital satisfaction determinants in Japan and the United States, and Zhu et al. (2022)[6] findings on maternal emotional labor in China. By situating Georgia within this broader framework, the study highlights how gender roles, conflict resolution, and psychosocial support operate within culturally specific systems, offering transferable insights for understanding family functioning in transitional societies.

This study provides culturally embedded insight into gendered family dynamics in Georgia, offering comparative value for intercultural family psychology and extending findings from prior cross-cultural research (e.g., Kamo, 1993; Zhu et al., 2022).[7] It explores the interplay between empathy, cooperative conflict resolution, and marital satisfaction, particularly within the context of traditional and evolving gender roles in Georgia.

Understanding the differences in family dynamics across age categories and genders can inform targeted interventions and support strategies for couples at various life stages, ultimately improving family well-being and marital satisfaction.

Research Hypotheses:

Gender Differences in Empathy and Conflict Resolution.

1. Women are more likely to exhibit higher levels of empathy and use cooperative strategies in marital conflict than men;
2. Spouses who demonstrate higher empathy and utilize cooperative strategies in conflict are more satisfied with their marriages.

Influence of Maternal Psychosocial Support on Family Dynamics.

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7 Ibid.

1. A mother's perception of psychosocial support affects her child's perception of support. and well-being.
2. A mother's perception of psychosocial support affects the father's perception of support, both her and her husband's perception of their financial situation, and their marital functioning.
3. A mother's perception of psychosocial support positively correlates with the likelihood of marital conflict for both her and her husband.

1. MATERIALS AND METHODS

The research consists of two phases, each examining family dynamics at different life stages in relation to gender roles, marital satisfaction, and family well-being. The first phase focuses on early-stage marriages, exploring how gender influences empathy and conflict resolution in the formative years. The second phase shifts to middle-aged parents with teenage children, investigating how perceptions of psychosocial support affect family well-being amid the challenges of adolescent development.

The first stage of this study utilized a probabilistic sampling method, and data were collected using Google Forms from April to May 2024. Respondents were informed about the anonymity of the research and that their responses would be used only in an aggregated form. Data were analyzed using IBM SPSS 20, employing univariate and multivariate analysis, independent samples t-tests, correlation analysis, and linear regression analysis.

A total of 150 early-age married respondents participated in the study, with 85 (56.7%) identifying as female and 65 (43.3%) as male. The majority (48%) were aged 18-24, while 55 (36.7%) were aged 25-34, and 23 (15.3%) were aged 35-44. There were used tools adapted in Georgian language. The Measurement tools were:

- Questionnaire Measure of Emotional Empathy (QMEE):[8] Developed by Albert Mehrabian and Norman Epstein in 1972, this questionnaire measures emotional empathy. It was adapted by Amiran Grigolava at the State Institute of Psychology of Uzbekistan. The QMEE consists of 33 statements, where respondents indicate their level of agreement based on their first reaction. Emotional empathy refers to the ability to share the feelings and experiences of others, distinct from cognitive empathy, which involves understanding another person's perspective without sharing their emotions;
- Thomas-Kilmann Conflict Mode Instrument: Created by Kenneth Thomas and Ralph Kilmann in the early 1970s,[9] this tool assesses conflict management styles based on two dimensions: assertiveness and cooperation. It identifies five behavioral styles in conflict situations, consisting of 30 statements with two possible responses, from which respondents select the one that best describes their behavior. In the current study, instructions will specify that responses relate to conflicts in marriage;
- Norton Quality of Marriage Index: This established tool, developed by Susan Norton in 1983,[10] evaluates marital satisfaction and overall relationship quality. The questionnaire consists of six statements covering various relationship aspects, using a Likert scale from "strongly agree" to "strongly disagree". It assesses dimensions such as communication, intimate relationships, conflict resolution, emotional support, and happiness in relationships. The results can help clinicians and researchers identify strengths and weaknesses in marital relationships.

On the second stage, to test our research hypotheses, in middle-aged spouses, we reanalyzed data from a study conducted in Spring 2023. The study involved 167 families in Georgia, with a total of 501 participants, including mothers, fathers, and their teenage children aged 11-18.

8 Mehrabian, A., Epstein, N. (1972). A measure of emotional empathy. Journal of Personality, 40(4), pp. 525-543. <doi.org/10.1111/j.1467-6494.1972.tb00078.x>.

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Table 1. *Distribution of Respondents by Marital Satisfaction*

Gender	N	Minimum	Maximum	M	SD
Female	85	19	45	38.08	6.55
Male	65	24	45	36.98	7.16
Total	150	19	45	37.60	6.82

Note. N = 150 respondents; M = mean; SD = standard deviation. Higher scores reflect greater marital satisfaction.

It covered various areas of family dynamics: Mother's Feeling of Support, Mother's Family Functioning, Mother's Marital Conflict, Financial Well-being Perceived by Mother, Child's Feeling of Well-being, Child's Feeling of Support, Father's Feeling of Support, Father's Family Functioning, Financial Well-being Perceived by Father, and Father's Marital Conflict. These scales were previously checked and found to be reliable and valid.

Participants completed a printed questionnaire. after providing informed consent to participate and share their answers for scientific studies. Participation was confidential and optional. Various recruitment methods were employed to ensure a fair and accessible process for all potential participants.

For the reanalysis using SPSS-21, mothers' feelings of support were chosen as the independent variable, while other variables depended on it.

This study was conducted in strict accordance with ethical research guidelines. The authors adhered to the APA ethical principles, the Code of Conduct of the French Psychology Society, and the recommendations of COPE (Committee on Publication Ethics). Research involving human participants complied with the Declaration of Helsinki, ensuring voluntary participation, anonymity, and confidentiality. The first stage of data collection received informed consent from all participants, while the second-stage reanalysis was based on previously approved research. Where applicable, ethical approval was obtained from the appropriate committee, and no identifying information was disclosed.

Sample size was determined based on the availability of participants within the research context. No data were excluded from the analyses. No experimental manipulations were applied. All study measures administered are reported in this manuscript.

2. RESULTS

2.1 Early marriage and gender roles in conflict and empathy

This stage highlighted whether gender-based expectations contribute to or hinder cooperative conflict resolution, which is particularly relevant in a cultural context like Georgia, where traditional gender roles are prevalent.

2.1.1 Marital satisfaction

The study utilized the Norton Quality of Marriage Index, consisting of 6 statements rated on a 7-point Likert scale, to assess marital satisfaction. A higher score indicates greater marital satisfaction. The overall average score for the respondents was 37.6, with a standard deviation of 6.82. There was a slight difference in marital satisfaction scores based on gender, with female participants averaging 38.08 and male participants averaging 36.89. (Table 1).

2.1.2 Empathy

The average score for the respondents is 20.1, with females averaging 20.61 and males averaging 19.51. In this study, the average score for respondents was 24.07, with a standard deviation of 3.8. Female respondents had an average score of 26.9 (SD=2.9), while male respondents had an average score of 25.2 (SD=7.2) (Table 2). The results suggest that female respondents exhibit higher empathy levels compared to male respondents. This indicates a potential gender difference in emotional empathy, with females scoring higher on average. The overall average score of the sample population reflects a moderate level of empathy.

Table 2. *Distribution of Respondents by Empathy Score*

Gender	N	Minimum	Maximum	M	SD
Female	85	18	29	26.9	2.9
Male	65	24	45	25.2	7.2
Total	150	15	29	24.07	3.8

Note. N = 150 respondents; M = mean; SD = standard deviation. Higher scores indicate greater levels of emotional empathy.

2.1.4 Conflict behavior strategies summary

The average empathy score for female respondents was significantly higher than that for male respondents (t(148) = 4.358, p < .01), supporting the study's first hypothesis regarding gender differences in emotional empathy (Table 3). These findings suggest notable differences in conflict resolution strategies and empathy based on gender, indicating the potential need for tailored approaches in conflict management.

2.1.4 Gender differences in conflict behavior

The study used an independent t-test to compare conflict behavior strategies between genders. Results indicated that:

Collaboration was significantly higher among females, with a mean difference significant at t=4.816, p<0.01t = 4.816, p < 0.01t=4.816, p<0.01;

Avoidance was more common among males, showing a significant difference at t=−3.095, p<0.01t = − 3.095, p < 0.01t=−3.095, p<0.01; (Table 4)

No other strategies showed significant gender differences.

2.1.5 Correlations between marital satisfaction, empathy, and conflict strategies

The study explored correlations between marital satisfaction, empathy, and conflict strategies

Table 3. *Distribution of Respondents by conflict Score*

Conflict Behavior Strategy	*N*	Min	Max	*M*	*SD*
Competition	150	0	12	3.49	2.79
Collaboration	150	4	11	6.73	1.83
Compromise	150	3	11	6.93	1.68
Avoidance	150	0	9	6.17	1.85
Accommodation	150	2	11	5.57	2.05

Note. N = 150 respondents; M = mean; SD = standard deviation. Conflict behavior strategies are assessed across competition, collaboration, compromise, avoidance, and accommodation modes.

Table 4. *Distribution of gender by conflict score*

Strategy	Gender	Mean Difference	t-value	p-value
Collaboration	Female >	Yes	4.816	< 0.01
Avoidance	Male >	Yes	-3.095	< 0.01
Other Strategies	-	No	-	-
Accommodation	150	2	11	5.57

Note. N = 150 respondents. Mean differences, t-values, and p-values are reported. A p-value < .01 indicates statistical significance.

Table 5. *Correlation between variables*

Variable	Marital Satisfaction Correlation (r)	Strength	p-value
Empathy	r = 0.525	Moderate	< 0.01
Competitiveness	r = – 0.595	Moderate	< 0.01
Avoidance	r = 0.196	Weak	< 0.01
Adaptation	r = 0.297	Weak	< 0.01

Note. N = 150 respondents. Pearson's correlation coefficients are presented. Correlation strengths are classified as Weak (r = 0.10–0.29), Moderate (r = 0.30–0.49), or Strong (r = 0.50–1.00). p < .01 indicates statistical significance.

using Pearson's correlation (Table 5):

- Empathy showed a moderate positive correlation with marital satisfaction (r=.525, p<0.01r = .525, p < 0.01r=.525, p<0.01);
- Competitiveness correlated negatively with marital satisfaction (r=−0.595, p<0.01r = –0.595, p< 0.01r=−0.595, p<0.01);
- while Avoidance and Adaptation correlated positively but weakly.

2.1.6 Regression analysis for predictors of marital satisfaction

A regression analysis identified Empathy and Competitiveness as significant predictors of marital satisfaction, explaining 46% of its variability (R=0.46, p<0.01R = 0.46, p < 0.01R=0.46, p<0.01). (Table 6)

These results support the hypothesis that gender influences specific conflict behavior strategies and that empathy and certain strategies are linked to marital satisfaction.

2.1.7 Marital satisfaction in middle-aged parents with teenagers

The second phase of research has some steps, where the initial step in our analysis involved examining the relationships between the mother's perception of psychosocial support and various family dynamics variables through correlation and regression analysis.

Correlation Analysis highlights several positive correlations between the mother's feeling of support and various family dynamics variables (Table 7):

- There's a significant positive correlation with: Family Functioning of both parents (r = .674, p< .01 & r = .562, p< .01); Marital conflict of both parents (r = .622, p< .01; r = .568, p< .01) and Father's feeling of support (r = .383, p< .01);
- Weaker positive correlations are found between the mother's feeling of support and financial well-being perceived father (r = .225, p< .01). Also, moderate positive correlations are observed with the child's feeling of well-being (r = .319, p< .01) and perceived Support (r = .344, p< .01);
- Additionally, there is no statistically significant connection between the mother's feeling of support and financial well-being perceived mother (r = .140, p > .05).

Regression Analysis indicates that the moth-

Table 6. *Marital satisfaction predictors*

Variable	Marital Satisfaction Correlation (r)	Strength	p-value
Empathy	r = 0.525	Moderate	< 0.01
Competitiveness	r = – 0.595	Moderate	< 0.01
Avoidance	r = 0.196	Weak	< 0.01
Adaptation	r = 0.297	Weak	< 0.01

Note. N = 150 respondents. Regression coefficients (Beta), t-values, and p-values are reported. p < .01 indicates statistical significance.

Table 7. *Correlation between the mother's feeling of support and various variables*

Variables	Mother's Feeling of Support
Mother's Family Functioning	0.674
Mother's Marital Conflict	0.622
Financial Well-being Perceived by Mother	0.14
Child's Feeling of Well-being	0.319
Child's Feeling of Support	0.344
Father's Feeling of Support	0.383
Father's Family Functioning	0.562
Financial Well-being Perceived by Father	0.225
Father's Marital Conflict	0.568

Note. N = 167 families. Pearson's correlation coefficients show associations between mothers' feelings of support and family variables. p < .01 indicates statistical significance.

er's feeling of support is a significant predictor of various aspects of family dynamics, including marital conflict, psycho-social support, well-being of the child, and overall family functioning (Table 8):

- Strong predictive effects are observed when the feeling of support significantly influences the dependent variables. For instance, the feeling of support strongly predicts family functioning as perceived by the mother, with a Beta of 0.674 and a t-value of 11.496, and father with a Beta of 0.0.562 and a t-value of 8.463, indicating a robust relationship. Similarly, marital conflict as perceived by the mother also shows a strong predictive effect by the mother's feeling, with a Beta of 0.622 and a t-value of 9.660, highlighting that changes in the feeling of support are closely related to changes in these dependent variables;
- The perception of psycho-social support of the mother has a moderate predictive effect on the father's perception of psycho-social support, with a Beta of 0.383 and a t-value of 5.92. Similarly, the well-being of the child, with a Beta of 0.319 and a t-value of 4.251, and the child's perception of psycho-social support of the child, with a Beta of 0.344 and a t-value of 4.632, indicate that the mother's feeling of support moderately influences the child's well-being.

Weak predictive effects are seen when the mother's feeling of support has no significant influence on the dependent variables. An example

Table 8. *Regression Analysis of Factors Influencing Family and Child Well-being*

Dependent Variable	B	Std. Error	Beta	t	p-value
Marital Conflict (Mother)	0.633	0.066	0.622	9.660	p < .01
Marital Conflict (Father)	0.536	0.065	0.568	8.273	p < .01
Perception of Psycho-Social Support (Child)	0.325	0.070	0.344	4.632	p < .01
Well-being (Child)	0.366	0.086	0.319	4.251	p < .01
Perception of Psycho-Social Support (Father)	0.719	0.136	0.383	5.920	p < .01
Family Functioning (Mother)	0.719	0.063	0.674	11.496	p < .01
Family Functioning (Father)	0.586	0.069	0.562	8.463	p < .01
Perception of Finances (Father)	0.339	0.115	0.225	2.955	.004

Note. N = 167 families. Regression coefficients (Beta), t-values, and p-values are presented. p< .01 indicates statistical significance.

of this is the perception of finances by the father, which shows a weak predictive effect with a Beta of 0.225 and a t-value of 2.955.

2.3 Summary

Research indicates significant gender differences in empathy and conflict resolution strategies, with women generally exhibiting higher levels of empathy than men. Findings show that female respondents score significantly higher on empathy measures compared to their male counterparts. Additionally, in marital conflicts, women tend to prefer cooperative strategies, such as collaboration, while men are more inclined to utilize neglectful approaches like avoidance. This aligns with the hypothesis that gender influences conflict resolution strategies, as the results confirm that spouses who demonstrate higher empathy and employ cooperative tactics tend to experience greater marital satisfaction, with positive correlations evident between these factors.

Furthermore, the influence of maternal psychosocial support on family dynamics plays a crucial role in shaping children's well-being and parental relationships. A mother's perception of support is positively correlated with her child's well-being and influences the child's perception of psychosocial support. Additionally, maternal support significantly impacts the father's perception of support, indicating a shared dynamic within the family unit. While the correlation between maternal support and financial perception is weak, it still suggests a positive influence. Importantly, higher maternal psychosocial support is associated with reduced marital conflict and enhanced marital functioning for both parents, illustrating its vital role in fostering healthy family relationships and dynamics.

3. FINDINGS AND DISCUSSION

Empirical data from early-stage and middle-aged marriages in Georgia illustrate the persistence of these gendered expectations. Women consistently report higher levels of empathy and cooperative conflict resolution strategies, aligning with social expectations of caregiving and emotional labor. However, the reliance on traditional gendered roles for emotional support often leads to asymmetrical dependencies, which can negatively impact marital satisfaction.11 Also, reduces emotional connection and promotes unhealthier resolutions, leading to decreased marital satisfaction.[12]

In contrast, men's preference for avoidance strategies can create barriers to effective communication and conflict resolution. This gendered approach may hinder relational satisfaction and contribute to unresolved issues, underscoring the necessity of encouraging men to engage in more empathetic and collaborative behaviors.[13]

Moreover, these gender dynamics in conflict resolution have broader implications for family functioning. As observed in the correlations presented in Table 7 and predictions in Table 8, maternal feelings of support significantly influence various aspects of family dynamics. A mother's ability to foster an emotionally supportive environment can help mitigate the negative effects of men's avoidance strategies, promoting healthier communication patterns and ultimately enhancing overall family well-being.

- Family Functioning: In Georgia, a mother's perception of support strongly predicts family functioning as perceived by both parents. This connection reflects Georgian cultural norms where mothers often play a central role in nurturing family relationships and maintaining emotional stability. When mothers feel supported, they experience less relationship stress, leading to better communication, cooperation, and mutual support among couples. This supportive environment contributes to family cohesion and stability, which are essential

11 Chkeidze, M., Gudushauri, T. (2024). The Interplay of Tradition and Modernity: A Case Study of Gender Roles in Georgian Society. *International Journal of Arts, Humanities and Social Sciences*, 5(4), pp. 1-10. <doi.org/10.56734/ijahss.v5n4a3>.

12 Gottman, J. M., Levenson, R. W. (1992). Marital processes predictive of later dissolution: Behavior, physiology, and health. *Journal of Personality and Social Psychology, 63*(2), pp. 221-230. <doi.org/10.1037/0022-3514.63.2.221>.

13 Varughese, B., Jayan, C., AV, G. (2023). Conflict styles & relationship satisfaction. *International Journal of Science, Engineering and Management, 10*(11), p. 38. <https://www.ijsem.org>.

for optimal child rearing and overall family well-being.[14]

- Marital Conflict: The feeling of support in Georgian mothers is a robust predictor of perceived marital conflict by both parents. Changes in the mother's sense of support correlate closely with changes in marital conflict levels. In Georgian culture, which highly values familial harmony, a mother's perception of support can contribute significantly to maintaining family stability. Feeling supported enables mothers to fulfill their roles effectively, thereby reducing tensions and enhancing marital satisfaction.[15]
- Father's Perception of Psychosocial Support: The mother's perception of psychosocial support moderately influences the father's perception of support. This dependency in Georgia reflects cultural norms emphasizing familial interconnectedness and collective well-being. When mothers feel supported, they create a positive family atmosphere that influences how fathers perceive their own roles and support contributions within the family.[16]
- Child's Well-being and Perception of Support: The mother's feeling of support moderately influences the child's well-being and their perception of support. This finding suggests that maternal support plays a crucial role in shaping children's overall well-being. When mothers feel supported, they cultivate stable and nurturing environments that positively impact their children, thereby enhancing overall family welfare.[17]
- Financial Well-being Perceived by Father: Georgian mothers' support perception has little effect on fathers' financial views or their own, reflecting traditional norms where financial decisions are paternal domains. While evolving economic and social roles challenge caregiving expectations, gender and emotional labor remain deeply linked, indicating institutional change alone may not shift ingrained family dynamics.[18]

This study highlights how gendered expectations in Georgian families are both socially constructed and ontologically embedded. While empirical findings confirm links between empathy, conflict resolution, and marital satisfaction, deeper theoretical engagement reveals that these relationships are shaped by structural gender constraints. Though economic and social shifts challenge traditional roles, ingrained expectations around emotional labor persist.

Mothers play a crucial role in nurturing family relationships and maintaining emotional stability. When they feel supported, it enhances family cohesion, reduces stress, and fosters healthier marital and parental relationships. Addressing maternal perceptions of support can lead to interventions that enhance communication, cooperation, and mutual understanding between spouses, ultimately promoting marital satisfaction and stability. Stable and nurturing family environments created through maternal support positively impact children's development and overall family dynamics.

The findings of this study contribute to intercultural psychology by illuminating how cultural scripts and value systems shape gendered roles and family functioning in a society undergoing so-

14 Taylor, Z. E., Conger, R. D. (2017). Promoting strengths and resilience in single-mother families. Child Development Perspectives, 11(2), pp. 87-92. <doi.org/10.1111/cdev.12741>.

15 Kitoshvili, N. (2023). Marital conflict and adolescent's psycho-social well-being: Mediation and moderation analysis. Scientific Bulletin of Mukachevo State University. Series Pedagogy and Psychology, 9(4), pp. 57-64. <doi.org/10.52534/msu-pp4.2023.57>.

16 Gaspar, T., Gomez-Baya, D., Trindade, J. S., Guedes, F. B., Cerqueira, A., de Matos, M. G. (2021). Relationship between family functioning, parents' psychosocial factors, and children's well-being. Journal of Family Issues, 0(0), pp. 1-18. <doi.org/10.1177/0192513X211030722>.

17 Leitão, C., Shumba, J. (2024). Promoting family well-being through parenting support in ECEC services: Parents' views on a model implemented in Ireland. *Frontiers in Education, 9*, 1388487. <doi.org/10.3389/feduc.2024.1388487>.

18 UNDP. (2019). *Men, women, and gender relations in Georgia: Public perceptions and attitudes*. United Nations Development Programme. Available at: <https://www.undp.org/georgia/publications/men-women-and-gender-relations-georgia-public-perceptions-and-attitudes>.

ciocultural transition. In Georgia, the persistence of traditional maternal and paternal roles can be understood as a manifestation of cultural continuity following the Soviet era, where state-defined gender expectations – such as the glorification of maternal sacrifice and the emphasis on male economic provision – continue to influence contemporary family dynamics. From the perspective of acculturation theory, Georgian society reflects a partial integration of modern egalitarian ideals with deeply rooted collectivist norms. This dynamic interplay between post-Soviet tradition and emerging values creates role strain, particularly for women, who navigate conflicting expectations between caregiving and self-actualization. Additionally, the patterns observed in empathy and conflict resolution align with the cultural orientation toward interdependence,[19] which prioritizes harmony and obligation over individual assertiveness. By framing gendered family roles through the lens of acculturation, cultural scripts, and independence–interdependence theory, this study not only interprets Georgian-specific trends but also informs broader intercultural understanding of how cultural structures mediate psychological processes related to family life.

CONCLUSION

This study analyzed data from 150 early-stage married couples and 167 middle-aged families to examine the relationships between empathy, cooperative conflict resolution, maternal psychosocial support, and family dynamics. The findings provide varying levels of support for the hypotheses:

Hypothesis 1: Confirmed. Women are more likely to exhibit higher levels of empathy and use cooperative strategies in marital conflict than men.

Hypothesis 2: Supported. Spouses who demonstrate higher empathy and utilize cooperative strategies in conflict report higher levels of marital satisfaction.

Hypothesis 3: Supported. A mother's perception of psychosocial support significantly influences her child's perception of support and overall well-being.

Hypothesis 4: Supported. A mother's perception of psychosocial support affects the father's perception of support, as well as both parents' perceptions of their financial situation and marital functioning.

Hypothesis 5: Supported. A mother's perception of psychosocial support positively correlates with the likelihood of marital conflict for both her and her husband.

In conclusion, these findings emphasize that maternal perceptions of support are central to understanding both marital satisfaction and family dynamics, revealing the broader implications of shifting gender roles and expectations in contemporary Georgian families.

Limitations and further plans for research

The study's limitations include using convenience sampling, limiting generalizability, and relying on self-reported data, which may be biased. The online survey format could exclude participants with limited internet access, and the focus on gender differences may overlook other factors like culture, socioeconomic status, or personality. Additionally, the study's focus on early and middle-aged marriages in Georgia limits its broader applicability, and the cross-sectional design prevents establishing causality. Future research will expand the sample, use a longitudinal approach, and explore additional factors like personality and external stressors, possibly incorporating qualitative methods.

Competing Interests

The author(s) has/have no competing interests to declare.

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ARTICLE

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STUDYING THE RELATIONSHIP BETWEEN SOME MACROECONOMIC VARIABLES AND ECONOMIC GROWTH IN ALGERIA USING THE ARDL MODEL

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Abstract. This study investigates the impact of exchange rate fluctuations, inflation, and oil prices on Algeria's economic growth from 1990 to 2022. Employing the Autoregressive Distributed Lag (ARDL) model and analyzed using EViews 12, the research evaluates both short – and long-term dynamics among these variables. The findings reveal a significant inverse relationship between exchange rate depreciation and economic growth, suggesting that currency instability adversely affects Algeria's economic performance. Similarly, inflation exhibits a negative long-term association with growth, highlighting the detrimental effects of rising price levels on the economy. Conversely, oil prices demonstrate a positive long-term relationship with growth, underscoring Algeria's reliance on hydrocarbon revenues as a key driver of economic expansion. The model's estimation results indicate that these independent variables collectively explain 91% of the variations in economic growth, confirming their substantial influence. These insights underscore the need for policymakers to stabilize exchange rates, control inflation, and diversify the economy to mitigate overdependence on oil. The study contributes to the empirical literature on macroeconomic determinants of growth in resource-dependent economies.

KEYWORDS: EXCHANGE RATE, INFLATION RATE, OIL PRICE, ARDL MODEL, ECONOMIC GROWTH.

INTRODUCTION

Economic growth is a key objective for all countries, whether developed or developing, due to its critical role in measuring development and societal progress. It reflects the total output of goods and services within an economy and is widely regarded as a fundamental indicator of economic performance. From a theoretical standpoint, economic growth remains one of the most significant topics in economic development, attracting the attention of prominent economists such as Adam Smith, David Ricardo, and Schumpeter, who sought to identify its key determinants.

Over time, economic realities have evolved, leading to shifts in the frameworks and theories used to explain growth. Today, economic growth is understood as the result of multiple and diverse factors, necessitating a thorough examination of all influencing variables – particularly economic ones. Among the most important macroeconomic variables affecting growth are the exchange rate, inflation, and oil prices. Against this backdrop, the study addresses the following research question: How do the exchange rate, inflation rate, and oil price influence economic growth in Algeria from 1990 to 2022?

This study aims to analyze the relationship between these macroeconomic variables and economic growth in Algeria, specifically assessing the impact of exchange rates, inflation, and oil prices.

To address the research question and achieve the study's objectives, a mixed-method approach is employed. The first part adopts a descriptive approach, reviewing prior studies and theoretical frameworks related to the variables under examination. The second part utilizes a quantitative analytical approach, applying the ARDL model to empirically assess the impact of selected macroeconomic variables on Algeria's economic growth from 1990 to 2022. The analysis is conducted using the EViews 12 software.

1. LITERATURE REVIEW

Chowdhury (2019) investigated the impact of macroeconomic variables – inflation (INF), real interest rate (INT), exchange rate (EXR), and household consumption expenditure growth (HCE) – on GDP growth in Bangladesh (1987–2015). Using correlation and multiple regression analysis, the study found a positive relationship between GDP and all variables except inflation.[1] The independent variables explained 75.60% of GDP variance, confirming their significant influence on economic growth.

Alam et al. (2022) examined the long-term relationship between investment, exports, imports, and government spending components (health, education, and other expenditures) on Saudi Arabia's GDP (1985–2018). Applying the ARDL cointegration and error correction model,[2] the study revealed a positive long-run relationship between GDP, investment, exports, and government education spending, while imports, health expenditures, and other government spending had a negative impact.

Akhtar and Nisa (2023) explored the combined effect of macroeconomic variables on Pakistan's economic growth (1970–2022) within the environmental Kuznets curve framework. The results indicated that energy use significantly increases carbon emissions, whereas manufacturing, exports, and financial development reduce them. Financial development, energy consumption, carbon emissions, and manufacturing positively influenced growth, while exports had a negative effect.[3]

Sulaiman (2023) employed the ARDL model to analyze the relationship between GDP growth and key variables (inflation, government spending, oil prices, and population growth) in Iraq (2003–2019). The findings confirmed a long-term equilibrium relationship, with oil prices being the most influential factor – consistent with Iraq's status as an oil-dependent economy.[4]

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2 Alam, F. et al. (2022). Economic growth in Saudi Arabia through sectoral reallocation of government expenditures. SAGE Open, 12(4), pp. 1-13. Available at: <https://doi.org/10.1177/21582440221132129>.

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2. THEORETICAL FRAMEWORK FOR STUDY VARIABLES

2.1 Economic growth

Achieving positive economic growth rates is a key priority for governments, particularly in developing and underdeveloped countries striving for economic development, poverty reduction, and overcoming socioeconomic challenges. Economic growth is a quantitative concept representing the annual increase in an economy's gross domestic product (GDP) (Fraj Muhammad Al-Qahtani& Khaled Zaki Al-Deeb, 2022). It refers to the rise in real net output over a specific period, typically a year or successive intervals. Additionally, economic growth entails an increase in real per capita income that outpaces population growth.[5]

According to Titoush Suhaila (2018), economic growth implies:

- An increase in real per capita income, not just GDP;[6]
- A real (not monetary) rise in national income, where per capita income growth exceeds inflation;
- A sustained, long-term increase rather than a temporary one.

Modern economic development is influenced by several key factors:

Capital Accumulation: Capital accumulation is a fundamental driver of economic growth, enhancing a nation's productive capacity.[7] Its rate depends on three factors:[8]

- The level of real savings, determined by the willingness and ability to save;
- The presence of financial institutions that mobilize savings for investment;
- The allocation of savings toward capital goods.

Human Capital: Investment in human capital expands individual capabilities, improves education and skills, and fosters innovation.[9]

Trade Openness: A more open economy, characterized by greater trade volumes, correlates with higher growth rates.[10]

Rate of Technical Progress: Technological advancement enhances both physical and human capital, boosting production and living standards. Its impact spans education, management, marketing, and production.[11]

2.2 Exchange rate

The exchange rate connects domestic and global economies, influencing resource allocation, export competitiveness, and import costs. It ties local prices to global market prices[12] and reflects the units of foreign goods needed to purchase one unit of domestic goods.[13]

2.3 Oil price

Oil pricing has evolved from well-based and port-based systems to monopolistic and later competitive pricing shaped by supply and demand.[14] It represents the monetary value of a petroleum commodity, denominated in USD and subject to market fluctuations.[15] The volatile na-

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15 Dardouri, R., Sararma, A. W. (2021). The impact of oil

ture of the oil market leads to constant price changes.[16] Crude oil prices reflect the USD value per barrel over the industry's development.[17]

2.4 Inflation

Inflation is a complex phenomenon with varying definitions. It denotes an abnormal price surge, described by Enelegame as a self-reinforcing price increase due to excess demand.[18] Friedman attributes it to excessive money supply growth.[19] Inflation measures the rate of price increases, either broadly (e.g., overall price levels or cost of living) or for specific goods/services.[20]

3. AN ECONOMETRIC STUDY OF THE IMPACT OF THE EXCHANGE RATE, OIL PRICE, AND INFLATION ON ECONOMIC GROWTH IN ALGERIA

To analyze the impact of key macroeconomic variables on Algeria's economic growth from 1990 to 2022, this study employs annual data sourced from the World Bank. The autoregressive distributed lag (ARDL) model, developed by Pesaran and Shin (2001),[21] is used due to its flexibility in handling variables with different integration orders – whether stationary at level (I(0)), first difference (I(1)), or a mix of both.

The study variables are defined as follows:

- **Dependent variable:** Economic growth (GDP).
- **Independent variables:** Real exchange rate (EX), inflation rate (INF), and oil price.

3.1 Description of the study variables

Table 1. *Statistical description of study variables*

VARIABLES	HIGHEST VALUE OF THE VARIABLE	MINIMUM VALUE OF THE VARIABLE	STANDARD DEVIATION	POSSIBILITY
Economic growth (GDP)	1.79E+16	7.85E+10	7.49E+15	0.105960
Exchange rate (EX)	221.1102	86.79975	25.90826	0.000000
Inflation rate (INF)	31.66966	0.339163	9.035550	0.000974
Oil price (OIL)	109.4500	12.80000	31.62205	0.212941

Source: Prepared by the researcher based on Eviews12 outputs

See Figure 1.

3.2 Testing time series stationarity

Economic literature mandates testing time series stationarity before estimating relationships. Many economic series exhibit non-stationarity due to a unit root, where the mean, variance, and covariance become time dependent. To address this issue, we employ the Augmented Dickey-Fuller (ADF) unit root test. The subsequent table presents our test results.

Table 2 reveals that the economic growth, inflation rate, and oil price series achieve stationarity at first difference, as confirmed by their 5% significance levels. The exchange rate series

prices on economic growth in Algeria for the period (1970-2020): An econometric study using the autoregressive distributed lag (ARDL) model. Journal of Economic and Financial Studies, 14(1), p. 413.

16 Lakhdari, I., Ghazazi, I. (2022). Econometric modeling of the impact of global oil price fluctuations on foreign exchange reserves in Algeria during the period (1990-2019). Journal of Contemporary Economic Research, 5(1), p. 468.

17 Ghazzazi, I. (2020). Modeling Brent oil price volatility using autoregressive models conditioned on non-variance consistency for the period (January 1990-July 2019). Journal of Strategy and Development, 10(1), pp. 91-111.

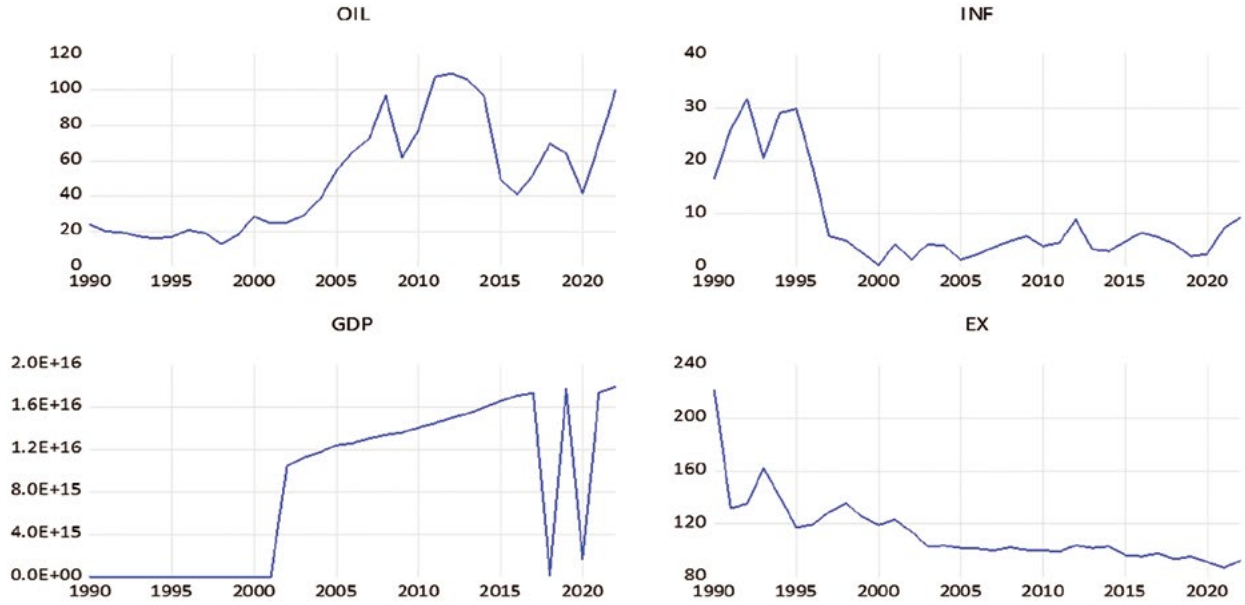
18 Mjahdi, K., Elzaar, H. B. (2023). Measuring the Impact of Inflation on Economic Growth During the Period (1980–2020). Al-Academia Journal of Social and Human Studies, 15, 720–727.

19 Baba, Q. M. M. S. (2021). The Relationship Between the Inflation Rate, Exchange Rate Changes, and the Trade Balance in Sudan for the Period 1999–2017. Journal of Quantitative and Qualitative Research in Economic and Administrative Sciences, 03(02), 93-120.

20 Younes, T. B., Ahmed, S. (2021). The impact of monetary and fiscal policies on inflation rates amid oil price volatility: A case study of Algeria for the period 1990–2016. Journal of Strategy and Development, 11(01), 426–446.

21 Pesaran, M. H., Shin, Y. (2001). Bounds testing approaches to the analysis of level relationships. Journal of Applied Econometrics, 16(3), pp. 289-326. Available at: <https://doi.org/10.1002/jae.616>.

Figure 1. *Evolution of study variables during the period 1990-2022*



Source: Prepared by the researcher based on Eviews12 outputs

demonstrates stationarity at both the level and first difference.

3.3 ARDL model estimation results

The ARDL model estimation results presented in Table 3 indicate statistical validity, supported by the significant Fisher statistic. Optimal lag lengths were determined as follows: 4 lags for economic growth, 4 for the exchange rate, 2 for the inflation rate, and 4 for the oil price. Consequently, the ARDL (4,4,2,4) specification emerges as the optimal model based on the Akaike Information Criterion (AIC).

3.4 Cointegration test

This test relies on the possibility of a long-term equilibrium relationship between the study variables by using the bounds test, as shown in the Table 4.

Table 2. *Time Series Stationarity Test*

VARIABLES ECONOMIC GROWTH (GDP)	ADF AT THE LEVEL			ADF FIRST DIFFERENCE			DECISION
	NON	INTERCEPT	TREAD ET INTERCEPT	NON	INTERCEPT	TREAD ET INTERCEPT	
Exchange Rate (Ex)	0.220916 (0.7437)	-1.054365 (0.7208)	-1.903808 (0.6285)	-12.34802 (0.0000)	-12.45870 (0.0000)	-12.24355 (0.0000)	I(1)
Inflation Rate (Inf)	-2.263888 (0.0249)	-6.054916 (0.0000)	-9.666080 (0.0000)	-11.68062 (0.0000)	-11.52248 (0.0000)	-11.02395 (0.0000)	I(0) I(1)
Oil Price	-1.405524 (0.1457)	-1.675411 (0.4337)	-1.836563 (0.6624)	-5.643859 (0.0000)	-5.612635 (0.0001)	-5.748241 (0.0003)	I(1)
Variables	0.054291 (0.6929)	-1.203260 (0.6607)	-2.167331 (0.4907)	-4.599833 (0.0000)	-4.622945 (0.0009)	-4.546191 (0.0054)	I(1)

Source: Prepared by the researcher based on Eviews12 outputs

Table 3. *ARDL model estimation results*

Sample (adjusted): 1994 2022
Included observations: 29 after adjustments
Maximum dependent lags: 4 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (4 lags, automatic): EX INF OIL
Fixed regressors: C
Number of models evaluated: 500
Selected Model: ARDL(4, 4, 2, 4)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
GDP(-1)	-0.330714	0.204558	-1.616725	0.1342
GDP(-2)	0.356915	0.210486	1.695672	0.1180
GDP(-3)	0.078144	0.257696	0.303241	0.7674
GDP(-4)	-0.478192	0.280708	-1.703521	0.1165
EX	1.14E+14	2.26E+14	0.503739	0.6244
EX(-1)	-5.70E+14	2.68E+14	-2.128984	0.0567
EX(-2)	2.29E+14	2.23E+14	1.027650	0.3262
EX(-3)	-2.99E+14	1.86E+14	-1.610998	0.1355
EX(-4)	2.85E+14	1.30E+14	2.197956	0.0503
INF	-6.41E+13	3.04E+14	-0.210744	0.8369
INF(-1)	5.10E+14	4.15E+14	1.228788	0.2448
INF(-2)	-6.99E+14	3.28E+14	-2.134099	0.0562
OIL	-3.96E+13	5.34E+13	-0.740830	0.4743
OIL(-1)	8.88E+13	7.10E+13	1.252105	0.2365
OIL(-2)	-2.24E+13	7.45E+13	-0.300819	0.7692
OIL(-3)	2.10E+14	7.19E+13	2.918264	0.0140
OIL(-4)	-9.77E+13	5.72E+13	-1.708632	0.1155
C	3.31E+16	1.95E+16	1.693781	0.1184

R-squared	0.912682	Mean dependent var	9.65E+15
Adjusted R-squared	0.777736	S.D. dependent var	7.24E+15
S.E. of regression	3.41E+15	Akaike info criterion	74.64269
Sum squared resid	1.28E+32	Schwarz criterion	75.49136
Log likelihood	-1064.319	Hannan-Quinn criter.	74.90848
F-statistic	6.763320	Durbin-Watson stat	2.638523
Prob(F-statistic)	0.001305		

*Note: p-values and any subsequent tests do not account for model selection.

Source: Prepared by the researcher based on Eviews12 outputs

Table 4. *Cointegration Test*

F-Bounds Test			Null Hypothesis: No levels relationship	
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	4.893217	10%	2.37	3.2
k	3	5%	2.79	3.67
		2.5%	3.15	4.08
		1%	3.65	4.66
			Finite Sample: n=35	
Actual Sample Size	29			
		10%	2.618	3.532
		5%	3.164	4.194
		1%	4.428	5.816
			Finite Sample: n=30	
		10%	2.676	3.586
		5%	3.272	4.306
		1%	4.614	4.666

Source: Prepared by the researcher based on Eviews12 outputs

The boundary test results (F-statistic = 4.89) exceed the upper critical values at all significance levels, as shown in Table 4. This leads us to reject the null hypothesis in favor of the alternative hypothesis, confirming a long-term cointegrating relationship among the study variables.

3.5 Diagnostic testing procedures

3.5.1 Heteroskedasticity testing

The Fisher probability statistics presented in Table 5 demonstrate statistical insignificance (p > 0.05) across all three test specifications, confirming the presence of homoskedasticity in the model residuals.

3.5.2 Serial correlation testing via the lagrange multiplier

We employ the Breusch-Godfrey test to examine residual autocorrelation, with the null hypothesis positing no serial correlation. The test utilizes Fisher's statistic to evaluate this hypothesis.

The Fisher probability statistic (0.1024) exceeds the 5% significance threshold, leading us to accept the null hypothesis of no autocorrelation in the model residuals.

3.5.3 Test for normal distribution of residuals

In Figure 2 the Jarque-Bera test statistic (0.799) exceeds the 5% significance level, leading to an acceptance of the null hypothesis and rejection of the alternative hypothesis regarding the non-normal distribution of model residuals. This indicates the residuals follow a normal distribution.

Table 5. *Test of heteroscedasticity of the model*

TEST	BREUSCH	ARCH	HARVEY
F-statistic	1.091504	0.086999	2.495288
Possibility	0.4534	0.7704	0.0634

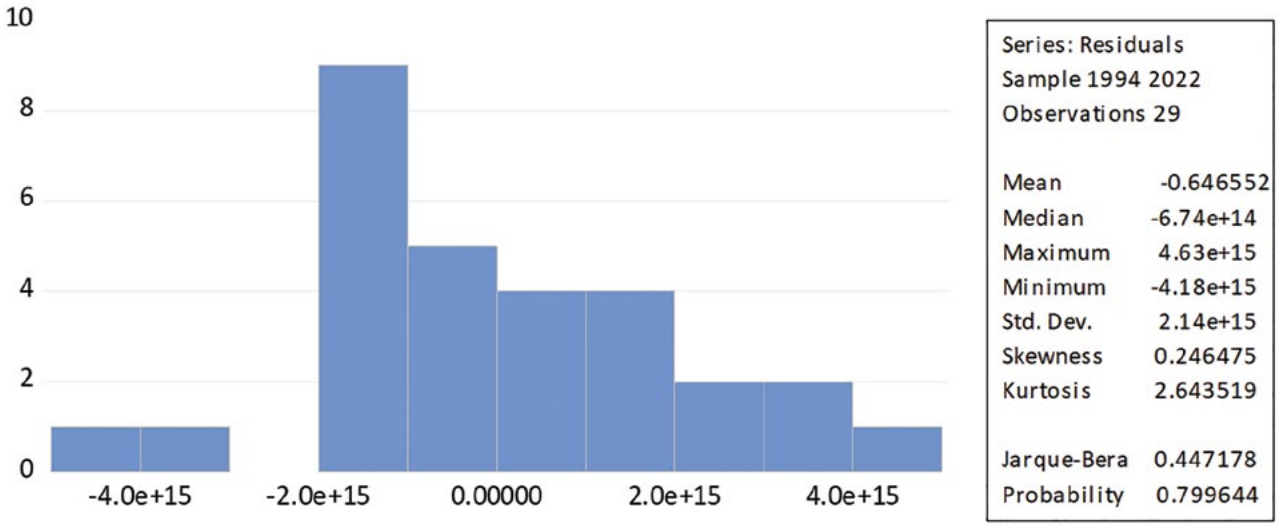
Source: Prepared by the researcher based on Eviews12 outputs

Table 6. *Lagrange factorial test for serial correlation between residuals*

Breusch-Godfrey Serial Correlation LM Test: Null hypothesis: No serial correlation at up to 2 lags		
F-statistic	2.966989 Prob. F(2,9)	0.1024
Obs*R-squared	11.52307 Prob. Chi-Square(2)	0.0031

Source: Prepared by the researcher based on Eviews12 outputs

Figure 2: *Test for normal distribution of residuals*

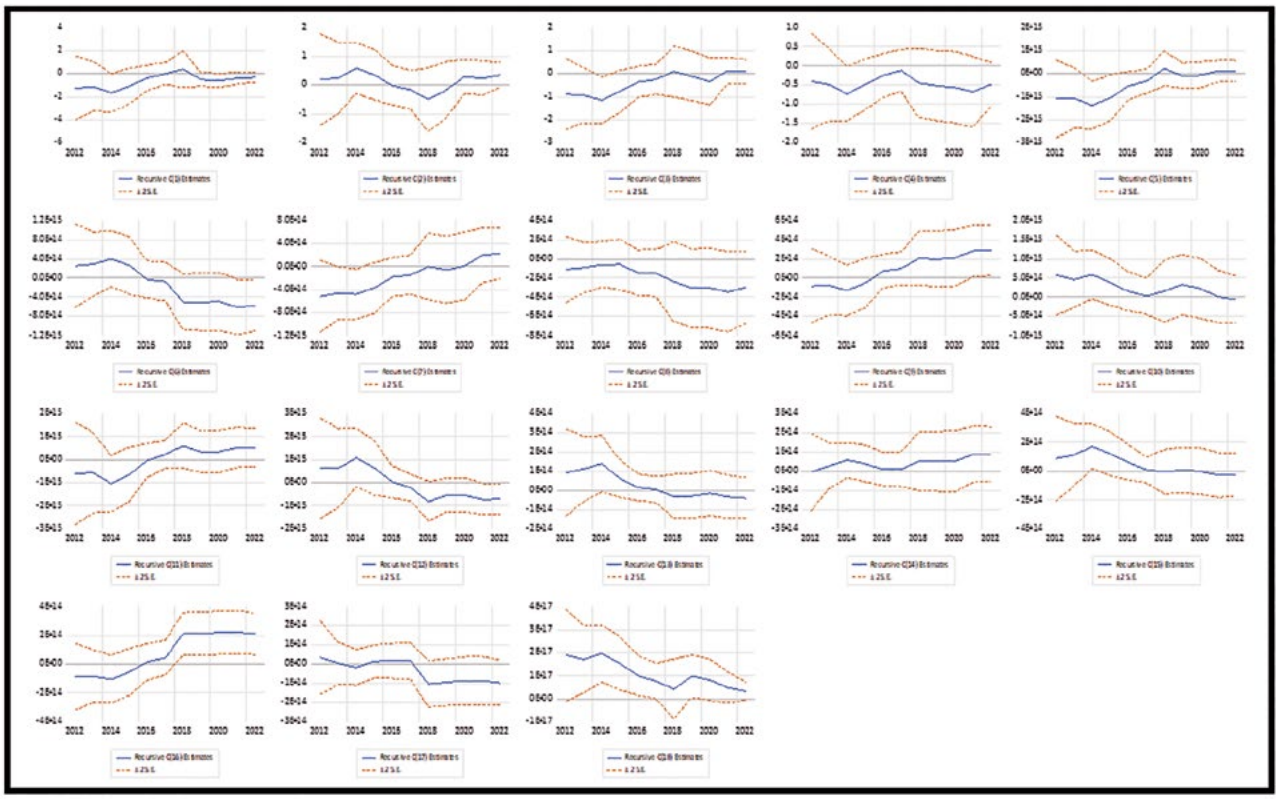


Source: Prepared by the researcher based on Eviews12 outputs

3.6 Structural stability test of parameters

The figure 3 demonstrates that the model's estimated coefficients maintain structural stability throughout the study period. This conclusion is supported by the test statistics remaining within the 5% significance critical bounds across all observations.

Figure 3. *Test recursive coefficients*



Source: Prepared by the researcher based on Eviews12 outputs

3.7 Estimation of long-term parameters

Table 7. *Estimation of model parameters in the long run*

VARIABLE	COEFFICIENT	STD. ERROR	T-STATISTIC	PROB.
Ex	1.76E+14-	9.95 E+13	1.880530	0.0868
Inf	-1.84E+14	1.74 E+14	-1.060177	0.3118
Oil	3.01E+14	3.91 E+13	2.583617	0.0254
C	2.41E+16	1.10 E+14	2.188832	0.0511

Source: Prepared by the researcher based on Eviews12 outputs

The results presented in Table 7 demonstrate significant long-run relationships between macroeconomic variables and economic growth in Algeria. Specifically, a 1% depreciation of the exchange rate leads to a 1.76% increase in economic growth, indicating an inverse relationship. Conversely, a 1% rise in oil prices corresponds with a 3.01% expansion of economic growth, showing a direct positive effect. The analysis also reveals that a 1% increase in the inflation rate results in a 1.84% contraction of economic growth, confirming an inverse relationship. These empirical findings are consistent with established economic theory and are supported by most econometric studies in this field.

Table 8. *Estimation of the short-term relationship under the error correction model*

ARDL Error Correction Regression
Dependent Variable: D(GDP)
Selected Model: ARDL(4, 4, 2, 4)
Case 2: Restricted Constant and No Trend
Date: 02/03/24 Time: 21:41
Sample: 1990 2022
Included observations: 29

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDP(-1))	0.043133	0.235875	0.182865	0.8582
D(GDP(-2))	0.400048	0.209106	1.913137	0.0821
D(GDP(-3))	0.478192	0.195865	2.441437	0.0327
D(EX)	1.14E+14	1.33E+14	0.000000	0.0000
D(EX(-1))	-2.15E+14	1.04E+14	0.000000	0.0000
D(EX(-2))	1.38E+13	9.54E+13	0.000000	0.0000
D(EX(-3))	-2.85E+14	8.05E+13	0.000000	0.0000
D(INF)	-6.41E+13	1.96E+14	0.000000	0.0000
D(INF(-1))	6.99E+14	2.15E+14	0.000000	0.0000
D(OIL)	-3.96E+13	3.78E+13	0.000000	0.0000
D(OIL(-1))	-8.96E+13	4.31E+13	0.000000	0.0000
D(OIL(-2))	-1.12E+14	4.34E+13	0.000000	0.0000
D(OIL(-3))	9.77E+13	4.24E+13	0.000000	0.0000
CointEq(-1)*	-1.373848	0.260059	-5.282831	0.0003

R-squared	0.894201	Mean dependent var	6.19E+14
Adjusted R-squared	0.802508	S.D. dependent var	6.58E+15
S.E. of regression	2.92E+15	Akaike info criterion	74.36683
Sum squared resid	1.28E+32	Schwarz criterion	75.02690
Log likelihood	-1064.319	Hannan-Quinn criter.	74.57355
Durbin-Watson stat	2.638523		

Source: Prepared by the researcher based on Eviews12 outputs

3.8 Estimating the Short-term Relationship within the Error Correction Model

In Table 8 the estimation results of the error correction model demonstrate a statistically significant (p-value = 0.0003) negative coefficient (-1.373848) for the error correction term (cointEq-1), indicating a robust short-run adjustment mechanism toward long-run equilibrium. The magnitude of the coefficient suggests that approximately 137% of short-run disequilibrium is corrected annually, implying an overshooting adjustment process. This finding confirms both the existence of a stable long-run relationship among the variables and a strong short-run dynamic interaction, as evidenced by the rapid and complete correction of deviations from equilibrium within a single period. The results are consistent with theoretical expectations regarding error correction mechanisms in cointegrated systems.

CONCLUSION

This study investigated the impact of exchange rates, inflation, and oil prices on Algeria's economic growth from 1990 to 2022 using the Autoregressive Distributed Lag (ARDL) model and EViews 12 software. The empirical findings reveal several key relationships:

First, the results confirm an inverse relationship between the exchange rate and economic growth. A depreciation of the Algerian dinar enhances export competitiveness and stimulates domestic production, thereby supporting economic expansion. Second, inflation exhibits a negative long-run impact on growth, as rising prices erode consumer purchasing power, suppress demand, and discourage investment. Conversely, oil prices demonstrate a positive relationship with economic growth, reflecting Algeria’s heavy dependence on hydrocarbon exports. Higher oil revenues enable increased government spending on development projects, fostering economic activity.

The econometric analysis yields the following specific findings:

- The bounds test confirms cointegration among the variables, indicating a stable long-run relationship;
- Inflation and exchange rates negatively affect economic growth in the long run;
- Oil prices positively influence economic growth in the long run;
- The model explains 91% of the variation in economic growth ($R^2 = 0.91$);
- The error correction term (-1.37) indicates rapid adjustment, with 137% of short-run disequilibria corrected annually;
- To promote sustainable growth, policymakers should consider;
- Implementing a flexible exchange rate regime to mitigate oil price volatility;
- Pursuing price-stability-oriented monetary policy;
- Accelerating economic diversification efforts;
- Improving the investment climate through governance reforms;
- Enhancing human capital through education and vocational training;
- These measures could help reduce Algeria’s vulnerability to external shocks while fostering more balanced and resilient economic development.

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CREDIBILITY OF USD DOMINANCE IN AN ERA OF UNCERTAINTY

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Abstract. The United States dollar (USD) has long served as the cornerstone of the global reserve currency system, maintaining its dominance for several decades. Nevertheless, this preeminence is increasingly challenged by a landscape characterized by geopolitical strife, shifts in economic power, and advancements in monetary technology. This paper investigates the validity of USD supremacy in light of China's ascendance as a formidable economic force and the rising discussions surrounding a potential reversion to the gold standard. The analysis focuses on China's expanding role through initiatives such as the internationalization of the renminbi (RMB), which aims to transform global trade and financial frameworks. Additionally, the paper considers both the historical and modern ramifications of a gold-backed monetary system, assessing its viability as a substitute for the current reliance on fiat currencies. Employing a multidisciplinary perspective, the study examines the interactions among these elements, offering insights into the durability of USD dominance and the potential for a multipolar currency landscape.

KEYWORDS: USD, RENMINBI, GOLD STANDARD, CURRENCY WEAPONIZATION, RISE OF CHINA.

INTRODUCTION

The United States dollar (USD) has functioned as the bedrock of the international financial and economic system since the mid-20th century, acting as the principal reserve currency and enabling global trade and investment. This preeminence has been bolstered by the substantial size and stability of the U.S. economy, the robustness of its financial markets, and the political and military clout of the United States. Nevertheless, the present climate of uncertainty, characterized by evolving geopolitical alliances, economic upheavals, and rapid technological progress, poses considerable challenges to the ongoing dominance of the USD.

A significant element contributing to this uncertainty is the emergence of China as a formidable global economic force. Through initiatives such as the Belt and Road Initiative (BRI) and the advocacy for the renminbi (RMB) in international commerce, China aims to contest the dollar's pivotal role in global financial architecture. Concurrently, there has been a resurgence of interest in the possibility of reinstating a gold-backed monetary system, driven by apprehensions regarding inflation, soaring sovereign debt, and the perceived volatility of fiat currencies. These trends prompt critical inquiries into the reliability and prospects of USD supremacy in the shifting global context.

This paper intends to investigate the fundamental components underpinning USD hegemony and assess the factors that jeopardize its sustained dominance. It will analyze the historical development of the dollar's position, the tactics employed by emerging economic powers to curtail its influence, and the ramifications of alternative monetary systems, such as the gold standard. By integrating economic, political, and historical analyses, the research aims to offer a thorough understanding of the challenges facing USD credibility and the potential trajectories for the future of global currency relations.

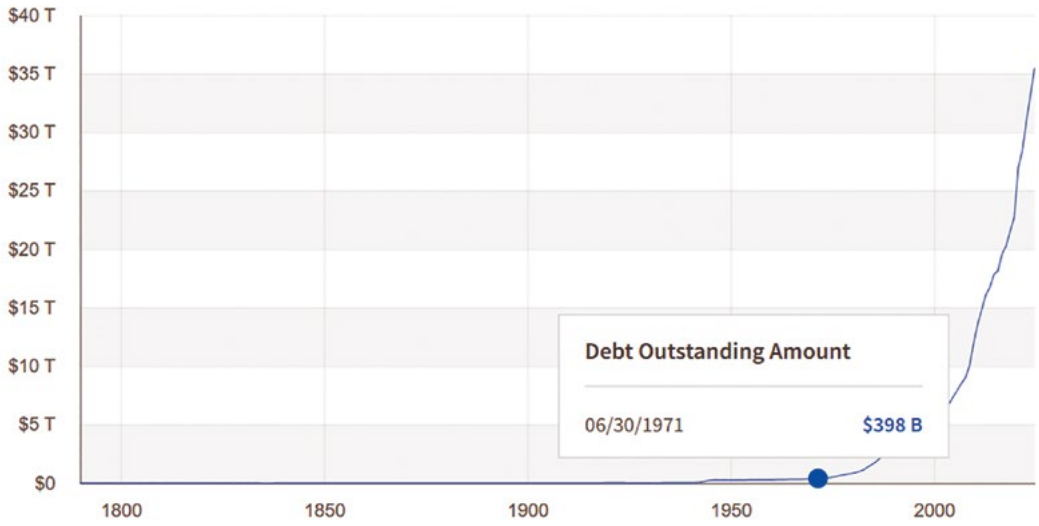
Risk and threats

There are three primary reasons why the US dollar continues to be the reserve currency of choice globally. One is that the US is a traditionally strong sovereign nation, backed by robust, persistent economic growth. Another is the democratic nature of the US government and its institutions. The international community trusts in the stability of its overarching structures. Third is a degree of inertia – the difficulty in changing the structure of global finance revolving around the dollar and US capital markets. Competing nations can boast some of these facets, but the US maintains all three advantages.[1]

Let's take a look at all the above-given criteria and see how their conditions look right now. The examination of the sovereign debt situation reveals a complex historical trajectory. The U.S. sovereign debt crisis has developed over several centuries, influenced by a variety of historical events, economic fluctuations, and decisions regarding fiscal policy. Initially, in 1790, the nation faced a debt of $75 million, which grew substantially during periods of conflict, notably during the Civil War and World War II, when the debt exceeded 100% of GDP in 1945. The acceleration of debt in contemporary times began in the 1980s, driven by tax reductions, heightened military expenditures, and increasing entitlement commitments, resulting in a tripling of the debt to $2.6 trillion by 1988. The financial crisis of 2008 represented another pivotal moment, as emergency fiscal measures escalated the debt from $10 trillion in 2008 to $15 trillion by 2011. The situation worsened during the COVID-19 pandemic, with the debt soaring to $33 trillion by 2023, alongside a debt-to-GDP ratio of 123%. In 2023, interest payments alone reached $475 billion, with projections indicating they could exceed $1 trillion annually by 2033. The current fiscal path appears untenable, characterized by ongoing

1 Aliaga-Díaz, R. (2024). Why the US dollar remains a reserve currency. Vanguard insights, macro-economics. Available at: <https://www.nl.vanguard/professional/insights/macro-economics/why-the-us-dollar-remains-a-reserve-currency-leader> (Last access: 12.07.2024).

Figure 1. *US Sovereign Debt Statistics by Decades*



Source: fiscaldata.treasury.gov

deficits, increasing interest expenses, and political stalemate regarding fiscal reforms, which pose considerable threats to economic stability and undermine global confidence in the creditworthiness of the United States.[2] (See Figure 1).

Political divisions regarding fiscal policy, coupled with ongoing impasses related to the debt ceiling, significantly heighten uncertainty and foster concerns about possible defaults or postponed payments. Such developments could result in downgrades of credit ratings, reminiscent of the 2011 incident when Standard & Poor's first reduced the U.S. credit rating. Should investors start to doubt the United States' capacity or willingness to effectively manage its debt, the demand for U.S. Treasury securities may diminish, leading to increased borrowing costs and jeopardizing the stability of global financial markets that depend on U.S. debt as a secure asset. This decline in confidence could initiate a cascading effect, threatening the U.S. dollar's position as the preeminent global reserve currency.

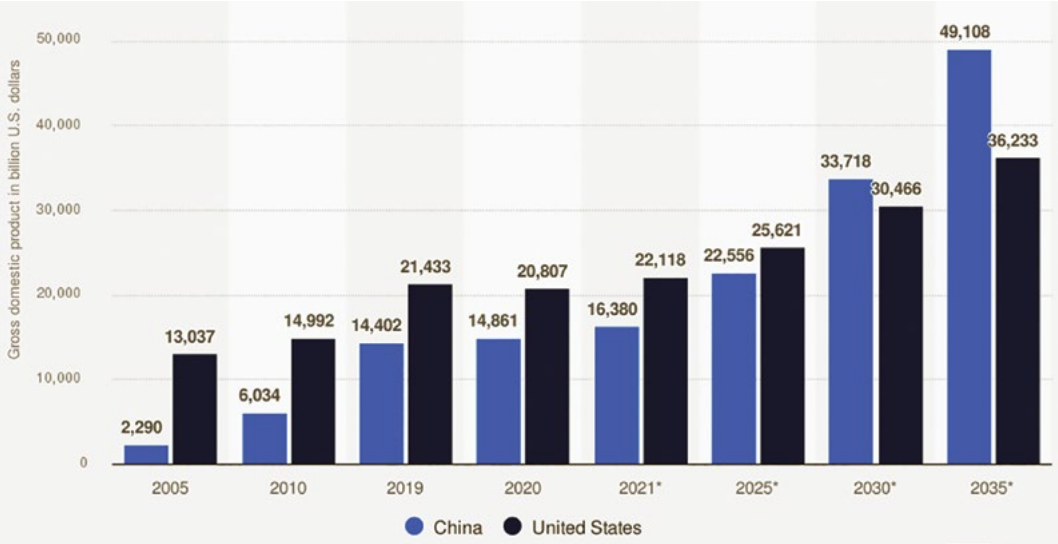
Make no mistake, if we continue on this path, investors will eventually lose confidence in our debt. The change could be gradual or sudden, but the consequences will be painful, no matter the pace. The federal government's interest costs, already at $892 billion for 2024, will increase dramatically, as investors demand a higher risk premium. That will force painful tax hikes or spending cuts. Private sector borrowing costs tied to Treasury rates will also spike, damaging economic growth. Banks, managed funds, insurance companies, pensions, and other investors will be exposed to trillions of dollars in market losses as the Treasuries they hold lose value, precipitating widespread distress in our financial system.[3]

The United States is confronted with significant challenges beyond its sovereign debt, particularly in light of China's swift economic ascent over recent decades. Once perceived as a distant rival, China's gross domestic product (GDP) has surged from under 5% of the global total in the 1990s to nearly 18% by 2023, positioning it as a formidable competitor to the United States, whose share has decreased from over 25% to around 22% during the same timeframe. When adjusted for purchasing power parity (PPP), China overtook the U.S. in GDP as early as 2014, indicating a significant reduction in the economic disparity between the two nations. This transformation is indicative of China's consistent growth, propelled by industrial development, technological progress, and a robust export-orient-

2 Fiscal Data. Historical Debt Outstanding. Available at: <https://fiscaldata.treasury.gov/datasets/historical-debt-outstanding/historical-debt-outstanding> (Last Access 04.01.2025).

3 Bair, Sh. (2024). U.S. Debt Could Drive the Next Financial Crisis. Barron's Commentary. Available at: <https://www.barrons.com/articles/national-debt-financial-crisis-harris-trump-investors-8608ce19> (Last access: 12.07.2024).

Figure 2. *Gross domestic product (GDP) at current prices (in billion U.S. dollars)*



Source: (O'Neill A, 2024)

ed strategy, contrasting with the U.S.'s more sluggish growth, which has been hindered by recurrent economic downturns and escalating debt levels. Although the U.S. continues to excel in innovation and per capita GDP, China's economic rise has altered the global power landscape, posing challenges to U.S. supremacy in trade, investment, and geopolitical influence. (See Figure 2).

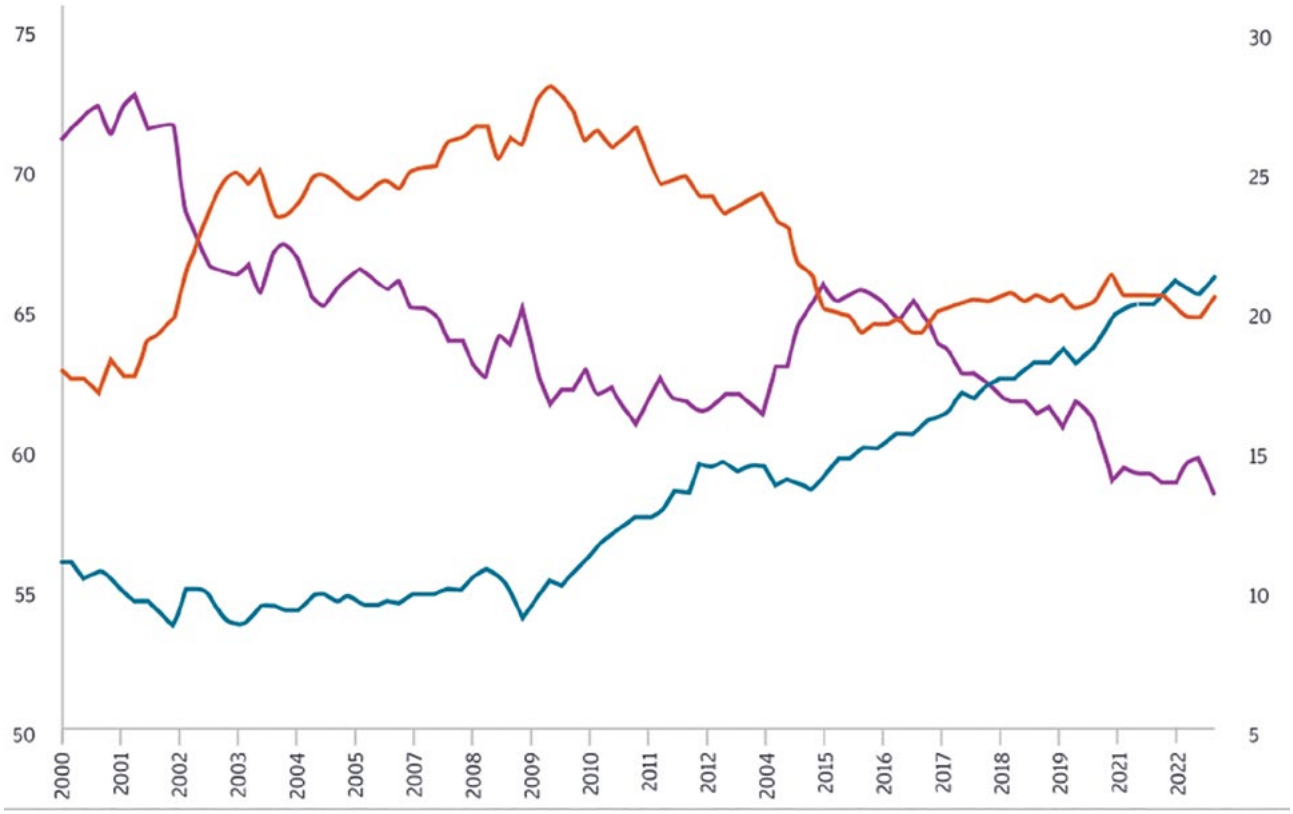
Since 1980, US GDP per capita growth has been far below its long-run average, and since 2007, it has been particularly weak. The rate at which the U.S. economy creates value on a per-person basis has ground to a near halt in recent years. From 1929 to 1979, real per capita GDP growth was 2.4% per year. Since then, it has been just 1.7% per year, and the most recent period has been particularly lackluster. From 2007 to 2015, real per capita GDP has been just 1% per year and a meager 1.4% since the nadir of the recession in 2009. To illustrate the problem from another angle, consider that from 1961 to 1981, real annualized growth in GDP per capita never fell below 1.5% over 10 years, and for 16 of the 21 years, 10-year per capita growth exceeded 2% on an annualized basis. Over the next 34 years until 2015, 10-year growth reached 2% only 13 times.[4,5]

Confidence serves as a fundamental pillar for any global currency, and the supremacy of the U.S. dollar as the preeminent reserve currency is significantly anchored in its perceived stability, liquidity, and dependability. Nevertheless, the escalating use of the dollar as a tool in geopolitical confrontations poses a threat to this confidence and may hasten the pursuit of alternative currencies. The 2022 decision to freeze the reserves of Russia's central bank in response to the Ukraine crisis raised alarms among other nations, particularly China, regarding the security of their dollar or euro-denominated reserves. Such measures heighten apprehensions that reserve assets could be wielded as instruments of political leverage, leading countries to seek diversification away from dollar assets to mitigate the risk of potential sanctions. This shift is illustrated by initiatives such as China's advocacy for the yuan in global trade and the endeavors of countries like India, Brazil, and members of the BRICS coalition to investigate alternatives to the dollar. Although the dollar continues to hold a dominant position for the time being, an extended reliance on its weaponization could erode trust in its impartiality, gradually undermining its role as the world's leading reserve currency and fragmenting the in-

4 Rothwell, J. (2016). No Recovery: An Analysis of Long-Term U.S. Productivity Decline. Gallup, Inc. Available at: <https://news.gallup.com/reports/198776/no-recovery-analysis-long-term-productivity-decline.aspx> (Last access: 12.07.2024).

5 O'Neill, A. (2024). Gross domestic product (GDP) at current prices in China and the United States from 2005 to 2020 with forecasts until 2035. Available at: <https://www.statista.com/statistics/1070632/gross-domestic-product-gdp-china-us/> (Last access: 04.01.2025).

Figure 3. *USD's share of FX reserves*



Source: (Chang J, 2024)

ternational monetary landscape. (See Figure 3).

Confidence is an indispensable requirement for a currency, and beyond a certain point of weaponization, the US undermines international confidence in the dollar as the world currency and accelerates states' search for alternatives. The more talk there is of appropriating Russia's reserves, the more countries like China fear their reserves held in dollars or euros may no longer be safe.[6,7]

Historically, the international dominance of the dollar, and to a lesser extent the euro, sterling, and yen, was supported by the fact that there existed well-organized markets between many local currencies and only these Big Four currencies. This required those seeking to trade other currency pairs to use the dollar or another member of the Big Four as a vehicle or intermediary currency, requiring the investor to pay an additional transaction cost in the form of a second bid-ask spread. Today, in contrast, there exist direct markets in a larger number of currency pairs in a larger number of financial centers. This is reflected in bid-ask spreads on foreign exchange transactions in nontraditional currencies that differ little from those on the majors. At the same time, central bank reserve managers have become more active in managing the investment tranche of their portfolios, whose magnitude has been growing, while many nontraditional currencies display attractive volatility-adjusted returns compared to their traditional competitors. Together, these factors have made for a shift out of the Big Four currencies (in practice mainly the dollar, which dominates the Big Four share).[8]

6 Wade, H.R. (2024). The beginning of the end for the US dollar's global dominance. The London School of Economics and Political Science. Available at: <https://blogs.lse.ac.uk/internationaldevelopment/2024/02/29/long-read-the-beginning-of-the-end-for-the-us-dollars-global-dominance/> (Last access: 12.07.2024).

7 Chang, J. (2024). De-dollarization: Is the US dollar losing its dominance? JPMorgan insights. Available at: <https://www.jpmorgan.com/insights/global-research/currencies/de-dollarization> (Last access: 04.01.2025).

8 Arslanalp, S., Eichengreen, B., Simpson-Bell, C. (2022). The Stealth Erosion of Dollar Dominance:

Figure 4. *China's Cross-border Payments by Currencies (%)*

Source: Bloomberg

Renminbi – opportunities and constraints

In light of the aforementioned challenges facing the United States and the U.S. dollar, China has been proactively promoting the renminbi (RMB) for cross-border transactions as part of its overarching strategy to internationalize its currency and diminish dependence on the U.S. dollar in international trade. The introduction of the Cross-Border Interbank Payment System (CIPS) in 2015 has significantly improved the efficiency and security of RMB transactions, providing a viable alternative to the SWIFT network. Additionally, China has broadened its network of bilateral currency swap agreements with more than 40 countries, facilitating direct trade settlements in RMB and eliminating the necessity for dollar conversions. This strategy is particularly prominent within the framework of China's Belt and Road Initiative (BRI), where there is a growing emphasis on RMB-denominated loans and payments. By 2023, the RMB had ascended to become the fifth most utilized currency in global payments, representing over 3% of total transactions, a notable increase from minimal levels a decade prior. China's commitment to enhancing RMB usage in energy trade, particularly in oil and gas transactions with Russia and Gulf nations, further reinforces this initiative. These endeavors not only advance China's geopolitical and economic objectives but also mirror a rising inclination among various countries to reduce their reliance on the dollar, particularly in light of increasing apprehensions regarding dollar weaponization and the stability of the global financial system.[9] (See Figure 4).

In the last ten years, China has introduced strategic policies to establish its network of offshore RMB markets to advance its currency's global status. These policies include a) the establishment of RMB clearing banks in offshore markets to facilitate settlements of RMB transactions overseas, b) the signing of bilateral RMB currency swap agreements to provide emergency RMB liquidity, and c) the provision of RMB qualified foreign institutional investor (RQFII) quotas that allow investing offshore RMB in China's onshore bond and equity markets. These arrangements encourage

Active Diversifiers and the Rise of Nontraditional Reserve Currencies. International Monetary Fund. Available at: <https://www.imf.org/en/Publications/WP/Issues/2022/03/24/The-Stealth-Erosion-of-Dollar-Dominance-Active-Diversifiers-and-the-Rise-of-Nontraditional-515150> (Last access: 12.14.2024).

9 Bloomberg. Youan Overtakes Dollar as China's Most-used Cross Border Currency. Available at: <https://www.bloomberg.com/news/articles/2023-04-26/yuan-overtakes-dollar-as-china-s-most-used-cross-border-currency> (Last access: 12.14.2024).

the international use of the RMB and facilitate the development of offshore trading in regional, international, and global settings.[10]

Today, it is beyond dispute that the RMB stands as the greatest potential rival to the U.S. dollar (USD). China's economic size, prospects for future growth, integration into the global economy, and efforts to internationalize its currency point toward an expanded role for the RMB in international macroeconomics and trade. China's successes in the realm of financial technology, the rapid adoption of mobile online transactions such as Alipay and WeChat Pay, and its digital currency pilot project are each bridging the gap between today's USD dominance and a potential RMB-led future.[11]

China's deficiency in political and judicial transparency significantly hinders the renminbi (RMB) from emerging as the preeminent currency for cross-border payments. The integrity of the global financial system is fundamentally anchored in trust, adherence to the rule of law, and the presence of reliable institutions, all of which are essential for fostering confidence in a reserve currency. Conversely, China's centralized political framework, coupled with its opaque decision-making and absence of an independent judiciary, discourages foreign investors and trading partners from fully adopting the RMB. The apprehensions surrounding unpredictable regulatory shifts, capital restrictions, and the likelihood of state interference in financial markets contribute to an environment of uncertainty for businesses and governments that hold RMB assets. Additionally, the limited safeguards for property rights and the inconsistent application of contractual obligations exacerbate risks for foreign entities, rendering the RMB a less appealing option as a stable and reliable currency for international trade and reserves. Unless China improves its transparency, fortifies the rule of law, and showcases a commitment to consistent and impartial governance, the RMB's potential to eclipse the U.S. dollar or euro as the leading cross-border payment currency will remain limited.

Notwithstanding, China is still very much in an intermediate solution to the trilemma. The capital account is still not fully open (strict limits on the flow of capital from China continue), and the authorities still maintain substantial ability to influence the evolution of the exchange rate. This implies that the authorities are trading off some loss of monetary policy autonomy in return for steps that contribute to the greater internationalisation of the RMB. Given the various economic issues facing China currently, this present policy choice of an intermediate policy regime is potentially more attractive than a corner solution of a fully flexible exchange rate and/or a fully open capital account. Moving to either a fully flexible exchange rate and/or a fully open capital account will require policy reforms in other areas, such as further strengthening the financial sector to be able to take on the volatility that inevitably accompanies such regimes.[12]

The notion of establishing a competitive reserve currency system under the leadership of authoritarian regimes presents a philosophical contradiction to the tenets of a rule-based international order. A functional global monetary framework relies on the creation and enforcement of explicit, transparent regulations that oversee financial transactions, currency exchanges, and trade activities. These regulations are intended to foster a stable environment where businesses, governments, and individuals can operate with assurance.[13]

The old-new gold standard

In an era characterized by uncertainty, the likelihood of reinstating the gold standard amid the diminishing supremacy of the U.S. dollar (USD) in

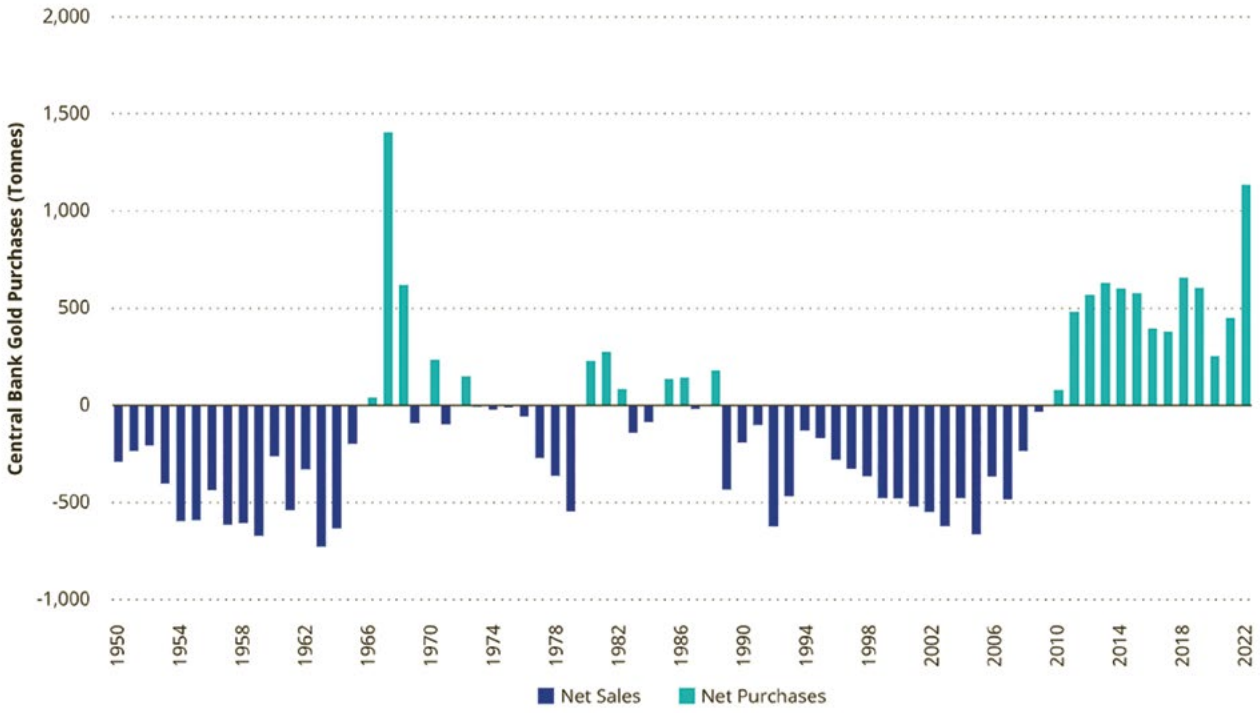
10 Cheung, Y. (2021). The evolution of offshore renminbi trading: 2016 to 2019. Journal of International Money and Finance. Available at: <https://www.sciencedirect.com/science/article/abs/pii/S0261560621000188> (Last access 12.14.2024).

11 Kurien, J. (2020). The Political Economy of International Finance: A Revised Roadmap for Renminbi Internationalization. Yale Journal of International Affairs. Available at: <https://www.yalejournal.org/publications/the-political-economy-of-international-finance-a-revised-roadmap-for-renminbi-internationalization> (Last access: 12.14.2024).

12 Ruijie, Ch. (2022). Renminbi internationalization and trilemma constraints. EAI Working Paper No. 169. Available at: <https://research.nus.edu.sg/eai/wp-content/uploads/sites/2/2022/12/EAI-WP-No.-169-RMB-Internationalization_Trilemma-Constraints-2.pdf> (Last access: 12.14.2024).

13 Khidasheli, M. (2024). Triffin Paradox in 21st Century. Economic Profile, Vol. 19, 1(27).

Figure 5. *Central Banks' Gold Purchases (Tons)*



Source: vaneck.com

international transactions presents a multifaceted challenge shaped by various economic, geopolitical, and institutional dynamics. The USD is increasingly scrutinized due to ongoing inflationary pressures, escalating national debt, and a waning global confidence in its monetary governance. This situation has led to a heightened interest in alternatives such as the Chinese yuan (RMB). Nevertheless, the RMB's capacity to replace the USD as the leading reserve currency is significantly hindered by China's authoritarian regime and the perceived inadequacies of its legal and judicial frameworks. These elements pose considerable risks for global investors and erode confidence in the RMB as a reliable and transparent medium for cross-border exchanges. Consequently, the concept of the gold standard has resurfaced in theoretical debates as a potential neutral and apolitical foundation for global monetary systems.

The absence of trust is a grave impediment to any monetary mechanism, whether backed by a rule-based gold standard or a discretionary-based dollar standard. The gold standard is bias-free, under which countries, even with the weakest credit, can achieve financial equality, plus those playing by the rules are rewarded for being trustworthy (and credible).[14,15] (See Figure 5)

The significance of a global payment unit, separate from any domestic currency, lies in its capacity to facilitate seamless and effective transactions within the worldwide economy. This particular currency acts as an impartial medium of exchange, unaffected by the economic policies or fluctuations of any individual nation. By providing a shared unit of measurement for international trade and finance, it diminishes transaction expenses, mitigates risks associated with exchange rates, and promotes enhanced transparency and trust in cross-border transactions.[16]

14 Taskinsoy, J. (2023). Reviving the Gold Standard. University Malaysia Sarawak (UNIMAS). Available at: <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4489492> [Last access: 12.29.2024).

15 VanEck. (2023). Will Investors Follow Central Banks into Gold? Available at: <https://www.vaneck.com/nl/en/blog/gold-investing/joe-foster-will-investors-follow-central-banks-into-gold> (Last Access 04.01.2025).

16 Khidasheli, M. (2024). Monetary Hypocrisy – Case Against the USD Hegemony. Multidisciplinary International Scientific Conference: "Sustainable Development: Modern Trends and Challenges". Available at: <https://unik.edu.ge/Articles_pdf/78772368a98f32df713e04896c5f478b.pd-

The idea of reinstating the gold standard in light of the diminishing supremacy of the U.S. dollar (USD) is largely unfeasible, especially when considered within the context of the 1945 Bretton Woods agreement. This system was established on the tenets of global collaboration, aimed at ensuring stable exchange rates and enhancing international trade in the wake of World War II. Central to this framework was the establishment of a stable monetary environment where currencies were linked to the USD, which itself was redeemable in gold. This model proved effective as it resonated with the postwar commitment to multilateralism, with nations focusing on shared economic recovery and development rather than individualistic pursuits. In stark contrast, the contemporary global economic landscape is marked by fierce trade conflicts, geopolitical tensions, and a struggle for market supremacy and economic power. Such circumstances erode the essence of international cooperation that underpinned the gold-based monetary system of the mid-20th century. The increasing division among major economies, along with the intricacies of modern financial systems, further reduces the practicality of a gold standard as a basis for international trade.

It remains one of the singular tragedies of modern world economic history that the Bretton Woods system did not come to its final logical maturity. What should have happened as Bretton Woods aged, and as postwar prosperity became an international fixture, is that each successful country should have consistently used a portion of its healthy savings built up during the prosperity to request allotments of gold from the United States, ultimately leave the system, and then establish its currency as directly fixed in gold. The system was primed to do this globally – to effect a return to the classical gold standard – yet this final result never came.[17]

CONCLUSION

The likelihood of reverting to the gold standard significantly decreases in the face of heightened political tensions and a trade conflict between Western nations and the Global South. The gold standard, along with the Bretton Woods system, relied on international collaboration, mutual trust, and economic agreement – elements that are fundamentally compromised by geopolitical strife and trade disagreements. Trade wars disrupt global trade balances, increase protectionist measures, and intensify distrust among countries, rendering the coordinated monetary policies necessary for a gold standard nearly unattainable. Additionally, the unequal distribution of gold reserves, with affluent Western countries possessing a disproportionate amount, would worsen economic disparities and exacerbate perceptions of financial imperialism, further alienating the Global South. The Bretton Woods Agreement, which linked currencies to the U.S. dollar and indirectly to gold, emerged from post-war unity and cooperative reconstruction efforts, rather than from discord and economic division. Political tensions and trade wars are in direct opposition to the principles of Bretton Woods, making the revival of a gold-backed monetary system not only impractical but also inconsistent with the realities of a divided global economy.

China's political framework poses a considerable obstacle to the Renminbi (RMB) achieving status as the dominant global reserve currency. Although the RMB has made significant strides towards internationalization, evidenced by initiatives such as the Belt and Road Initiative and its incorporation into the International Monetary Fund's Special Drawing Rights (SDR) basket, the establishment of a reserve currency necessitates a robust level of transparency, adherence to the rule of law, and an autonomous monetary system. The centralized nature of China's governance, coupled with the absence of comprehensive capital account liberalization and state oversight of financial markets, diminishes the currency's attractiveness to international investors. Additionally, apprehensions regarding political influence over economic policies and the opaque deci-

f#page=9.55> (Last Access 12.29.2024).

17 Dimitrovic, B. (2012). The Argument for Returning to the Gold Standard: The Lessons of Contemporary History. Free Market Forum. Sam Houston State University. Available at: <https://www.hillsdale.edu/educational-outreach/free-market-forum/2012-archive/the-argument-for-returning-to-the-gold-standard-the-lessons-of-contemporary-history> (Last Access 12.29.2024).

sion-making processes of the Chinese Communist Party generate uncertainty among foreign stakeholders. Unless these fundamental challenges are resolved, the RMB's capacity to supplant the U.S. dollar or the euro as the preeminent global reserve currency will remain limited.

China's judicial system poses a considerable obstacle to its aspirations of becoming a global financial center that can influence the international stock market similarly to the New York Stock Exchange (NYSE). A strong and unbiased legal framework is essential for fostering investor trust, safeguarding property rights, and effectively resolving disputes – fundamental components of any thriving financial center. Nevertheless, the Chinese judiciary is often viewed as lacking autonomy from political pressures, with courts tending to favor state or party interests over the fair application of the law. This situation generates uncertainty for both foreign and domestic investors, who may be reluctant to fully participate in China's financial markets. Furthermore, the irregular enforcement of regulations, unclear legal processes, and inadequate protections for shareholder rights further weaken China's position in establishing itself as a reliable global financial hub. Without significant reforms aimed at improving transparency, consistency, and impartiality within its justice system, China's financial markets will likely find it challenging to attain the credibility necessary to compete with established global leaders such as the NYSE.

The legal framework must fundamentally guarantee that the rights associated with contracts and property are articulated with clarity and predictability. In the event of a dispute, the parties involved in the contract should ideally refrain from pursuing legal action except as a final measure. Additionally, in cases of litigation, it is essential that the judiciary operates independently, capable of adjudicating claims efficiently and within a reasonable timeframe. Furthermore, once a judgment is rendered, it should be enforced promptly.

The Renminbi (RMB) faces challenges in becoming a leading international reserve currency; however, China's robust economic performance and its status as a major exporter provide a favorable context for the RMB to emerge as the primary reserve currency within the BRICS coalition. China's significant role as the principal trading partner for numerous BRICS nations, along with its efforts to diminish dependence on the U.S. dollar through various bilateral trade agreements and the implementation of RMB settlement frameworks, is enhancing the currency's prominence within this group. Additionally, the shared objective among BRICS nations to lessen their reliance on Western-centric financial systems presents a viable opportunity for the RMB to function as a regional reserve currency, similar to the euro's role in the European Union. By capitalizing on its economic strength, fostering deeper financial connections within BRICS, and advocating for RMB-centered trade and investment initiatives, China could effectively establish the RMB as a central element of financial interactions among BRICS countries, even if it continues to play a secondary role in the global financial landscape.

Considering the aforementioned factors, it is anticipated that BRICS, akin to Europe, will establish its own de facto intra-bloc reserve currency, with the Renminbi (RMB) assuming a pivotal position in financial transactions among BRICS nations. Nevertheless, on a global scale, the U.S. dollar is projected to maintain its status as the predominant reserve currency, owing to its established advantages, unmatched liquidity, and the robustness of its international financial infrastructure. The dollar's profound integration into global trade, investment, and payment mechanisms guarantees its sustained importance in cross-border exchanges. Although the ascendance of the RMB within BRICS may pose a regional challenge to the dollar, its overall influence on the USD is expected to be limited, akin to the euro's impact. Just as the euro emerged as a notable but regionally confined reserve currency without displacing the dollar on a global scale, the RMB is likely to enhance its presence within BRICS while not fundamentally jeopardizing the dollar's position as the leading global reserve currency.

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ARTICLE

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EXPLORING THE POSITIVE IMPACT OF REMOTE WORK ON JOB SATISFACTION: The Mediating Roles of Career Plateau, Autonomy, and Trust

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Abstract. Based on survey responses from public-sector workers and the IT contractors who work with them (N = 196 for analyses), we explore how remote work is related to satisfaction through autonomy, career plateau, and trust, and the degree to which remote work serves to buffer the negative link between plateau and satisfaction. Results reveal a positive direct effect of remote work on job satisfaction (b=0.114, p=.011), with autonomy mediating a beneficial indirect path (b=0.025, p<.05) and career plateau exacerbating a negative indirect path (b=−0.087, p<.05). Trust does not emerge as a significant mediator, but remote work moderates the negative association between career plateau and satisfaction (b=0.173, p=.010), suggesting a buffering effect. The parallel-mediation model explains 39.7% of the variance in job satisfaction, highlighting the complex interplay between flexibility and career stagnation. These findings combine the work-design and career-plateau perspectives: remote working recrafts resources (autonomy) and constraints (plateau) together. Implications entail balancing schedule/location freedom with explicit development trajectories and visibility cues for those who are remote. Our findings contribute to theory by delineating when remote work acts as a resource or constraint, while offering practical insights for organizations navigating hybrid work models.

KEYWORDS: REMOTE WORK, AUTONOMY, CAREER PLATEAU, JOB SATISFACTION, PUBLIC SECTOR, HYBRID WORK.

INTRODUCTION

Remote Work, Career Plateau, Autonomy, Trust, and Job Satisfaction

Remote work has now firmly entered the modern workplace. The COVID-19 pandemic greatly sped up adoption, but its staying power builds on more fundamental changes in work design, managerial control systems, and employee preferences. Research shows potential benefits that endure (e.g., increased autonomy, better work–life balance, and, in some, increased productivity) but also continuing risks (e.g., boundary control, professional isolation, or career restrictions.[1]

But for all these dramatic changes, theory has yet to catch up to practice. What is less well understood is how remote work interacts with employees' experiences at a career plateau, or how autonomy and trust interact to mediate the effects of remote arrangements on job satisfaction. On its face, the net effect of remote work on employee attitudes looks simple: Remote work expands autonomy, and it saves people from dealing with the commuting time losses, both of which make people happier. There is meta-analytic evidence that Remote work is positively associated with perceived autonomy and work-family outcomes.[2]

Field studies also show that in certain organizational contexts, working remotely can increase productivity without affecting its quality.[3] However, there is equally compelling evidence for countervailing dynamics. Randomized and quasi-experimental studies indicate that workers working at a distance may be promoted less, even though their performance exceeds that of workers in the office, consistent with an inferior visibility or managerial bias hypothesis.[4] On a large-scale institutional level, these communications report intensification, after-hours reachability norms (Right to disconnect), and on the one hand, risks to mental health within a weak governance system.[5]

Theoretically, it is crucial to clarify these contradicting mechanisms. We propose career plateau – structural (limited promotion) as the missing link. Career plateau is a powerful predictor of reduced motivation, commitment, and job satisfaction.[6,7] The "classic" interventions to address the plateau (job rotation, mentoring, sponsorship, and developmental assignment) implicitly rely on physical proximity and supervisor-initiated support. Under remote or hybrid models, these levers may not be applied with any degree of consistency; in fact, remote contexts can either deny plateaued workers the visibility necessary for restarting advancement or, when properly managed and well designed, can mitigate the side effects of plateau.[8] Hence, whether working remotely mitigates or accelerates the plateau has broad, and yet unanswered, theoretical implications, as well as practical implications given the growing trend in remote working.

Our research builds on work-design theory[9] and career-plateau literature[10] to propose a parallel-mediation model. We hypothesize that first,

1 Bloom, N., Liang, J., Roberts, J., Ying, Z. J. (2015). Does working from home work? Evidence from a Chinese experiment. Quarterly Journal of Economics, 130(1), pp. 165–218. <doi.org/10.1093/qje/qju032>.

2 Gajendran, R. S., Harrison, D. A. (2007). The Good, the Bad, and the Unknown About Telecommuting: Meta-Analysis of Psychological Mediators and Individual Consequences. Journal of Applied Psychology, 92(6), pp. 1524–1541.

3 Choudhury, P., Foroughi, C., Larson, B. (2021). Work-from-anywhere: The productivity effects of geographic flexibility. Strategic Management Journal, 42(4), pp. 655–683. <doi.org/10.1002/smj.3251>.

4 Bloom, N., Liang, J., Roberts, J., Ying, Z. J. (2015). Does working from home work? Evidence from a Chinese experiment. Quarterly Journal of Economics, 130(1), pp. 165–218. <doi.org/10.1093/qje/qju032>.

5 Eurofound. (2023). Living and working in Europe 2023. <doi.org/10.2806/500819>.

6 Hu, C., Zhang, S., Chen, Y. Y., Griggs, T. L. (2022). A meta-analytic study of subjective career plateaus. Journal of Vocational Behavior, 132. <doi.org/10.1016/j.jvb.2021.103649>.

7 Nachbagauer, A. G. M., Riedl, G. (2002). Effects of concepts of career plateaus on performance, work satisfaction and commitment. International Journal of Manpower, 23(8), pp. 716–733. <doi.org/10.1108/01437720210453920>.

8 Bareja-Wawryszuk, O., Togonidze, V., Aslantas, M. (2025). The impact of career plateaus on employee job satisfaction. The Moderating Role of Remote Work. Management and Administration Journal, 63(2). <doi.org/10.34739/maj.2024.02.11>.

9 Solomon, E. E. (1986). Private and Public Sector Managers: An Empirical Investigation of Job Characteristics and Organizational Climate. In Journal of Applied Psychology, Vol. 71, Issue 2.

10 Yang, W. N., Niven, K., Johnson, S. (2019). Career plateau: A review of 40 years of research. In Journal of Vocational Behavior, Vol. 110, pp. 286–302. Academic Press Inc. <doi.org/10.1016/j.jvb.2018.11.005>.

remote work enhances job satisfaction by increasing autonomy, second, satisfaction is diminished by amplifying career plateau perceptions, and third, trust moderates these relationships. Additionally, we test whether remote work buffers the negative impact of career plateau on satisfaction, a mechanism that is not overlooked in prior studies. We theorize that the consequences of remote work for job satisfaction flow through two canonical yet under-integrated mechanisms: autonomy and trust. Autonomy – the degree of decision latitude and control over one's tasks and timing – is a central driver of positive work attitudes.[11]

The study's contributions are as follows: First, to explain remote work's dual effects, it integrates theoretical perspectives – autonomy as a job resource and career plateau as a demand. Second, it extends the applicability of these frameworks to public-sector contexts, where institutional factors shape work-design outcomes differently than in private organizations.[12] Work-design and HRM levers translate into outcomes. For example, in Kuwait, HRM becomes 'a vehicle for diversity management',[13] and large-sample evidence shows knowledge utilization mediates performance effects.[14]

Empirically, we examine public-sector employees because they commonly face strong procedural constraints, formalized evaluation systems, and hierarchical authority structures that are slow to adapt to virtual collaboration. These features render plateau salient and make the interplay of autonomy and trust particularly consequential for job satisfaction.[15,16] The setting thus provides a conservative test of our theorized mechanisms and generates insights with broader relevance to organizations attempting to sustain engagement under hybrid or fully remote regimes. Empirical evidence supports our hypotheses. Autonomy mediates a positive indirect path (b=0.025), while career plateau mediates a negative one (b=−0.087). Trust does not significantly mediate the relationship, but remote work weakens the plateau-satisfaction link (b=0.173), highlighting its buffering role. These findings align with recent work on hybrid models.[17,18]

The remainder of this paper is organized as follows: Section 2 reviews theoretical foundations and develops hypotheses. Section 3 details the methodology, including sampling and analytical procedures. Section 4 presents results, and Section 5 discusses implications for theory and practice. The conclusion synthesizes key findings and outlines future research directions.

LITERATURE REVIEW

The relationship between remote work and job satisfaction has been extensively examined through the lens of work-design theories, particularly the Job Demands-Resources (JD-R) model.[19] This framework posits that job resources, such as autonomy, enhance satisfaction by facilitating

11 Gajendran, R. S., Harrison, D. A. (2007). The Good, the Bad, and the Unknown About Telecommuting: Meta-Analysis of Psychological Mediators and Individual Consequences. Journal of Applied Psychology, 92(6), pp. 1524–1541. <doi.org/10.1037/0021-9010.92.6.1524>.

12 Lachman, R. (1985). Public and Private Sector Differences: CEOs' Perceptions of Their Role Environments. In Academy of Management Journal, Vol. 28, Issue 3.

13 Abidi, O., Zaim, H., Youssef, D., Baran, A. (2017). Diversity Management and Its Impact on HRM Practices: Evidence from Kuwaiti Companies. Eurasian Journal of Business and Economics, 10(20), pp. 71–88. <doi.org/10.17015/ejbe.2017.020.05>.

14 Zaim, H., Muhammed, S., Tarim, M. (2019). Relationship between knowledge management processes and performance: critical role of knowledge utilization in organizations. Knowledge Management Research and Practice, 17(1), pp. 24–38. <doi.org/10.1080/14778238.2018.1538669>.

15 Montgomery, D., Montgomery, D. (n.d.). Happily Ever After: Plateauing as a Means for Long-Term Career Satisfaction. <https://www.researchgate.net/publication/297899898>.

16 Yang, W. N., Niven, K., Johnson, S. (2019). Career plateau: A review of 40 years of research. In Journal of Vocational Behavior. Vol. 110, pp. 286-302. Academic Press Inc. <doi.org/10.1016/j.jvb.2018.11.005>.

17 Milliman, J. F. (1992). Causes, Consequences, and Moderating Factors of Career Plateauing. Dissertation, University of Southern California.

18 Supplemental Material for One Hundred Years of Work Design Research: Looking Back and Looking Forward. (2017a). Journal of Applied Psychology.

19 Bakker, A. B., Demerouti, E. (2007). The Job Demands-Resources model: State of the art. In Journal of Managerial Psychology, Vol. 22, Issue 3, pp. 309–328. <doi.org/10.1108/02683940710733115>.

goal achievement, whereas job demands, like career stagnation, deplete motivation. Remote work uniquely intersects both pathways, acting as a resource through flexibility while potentially introducing demands via reduced career visibility.[20]

Trust, – lateral (collegial) – is foundational to coordination under conditions of information asymmetry and reduced direct supervision; yet empirical research during the pandemic offers mixed findings on whether remote work strengthens trust (by signaling organizational support) or erodes it (by amplifying monitoring frictions, reduced visibility, and uncertainty).[21] We posit that autonomy and trust operate as linked pathways that can either buffer or amplify the negative effects of plateau on satisfaction in remote settings. Although prior research on trust has been mainly conducted in traditional office settings, it is believed that the remote nature of work may change individuals' patterns in evaluating trust.[22] The quality of communication in remote teams often depends on the level of trust. A recent study found that when employees felt isolated during the pandemic, communication quality declined, and low information-sharing in turn reduced trust levels.[23] In other words, the isolation loop in turn led to lowering trust levels. However, when teams intentionally maintained high-quality communication, they preserved trust and thus prevented work-related isolation.[24] This means that a lack of information is less frustrating for employees with high levels of trust in their peers, as the need for extra information is inversely related to trust levels.[25]

Conceptually, we view remote work as a contextual resource that can expand decision latitude and task control (autonomy) but may simultaneously attenuate informal visibility, thereby undermining advancement prospects and trust. Career plateau captures constraints on perceived future movement. When autonomy is high and trust is strong, plateaued employees can reconfigure work around meaningful task variety and schedule control, improving satisfaction despite limited formal advancement opportunities. When autonomy is low or trust is weak, remote work can intensify plateau's negative effects by isolating employees from information flows and support networks.

Autonomy emerges as a central mechanism linking remote work to satisfaction. The Conservation of Resources (COR) theory further explains this relationship, suggesting that autonomy preserves psychological resources by minimizing role conflict.[26] However, autonomy's benefits may be context-dependent. Public-sector employees, for instance, often face rigid accountability structures that constrain the positive effects.[27] Autonomy Pathway. Remote work affords greater control over the timing and location of tasks, which should increase intrinsic motivation. We therefore expect remote work to exert a positive indirect effect on job satisfaction via autonomy, particularly for employees who perceive a plateau but retain latitude to redesign tasks.[28]

20 Gajendran, R. S., Harrison, D. A. (2007). The Good, the Bad, and the Unknown About Telecommuting: Meta-Analysis of Psychological Mediators and Individual Consequences. Journal of Applied Psychology, 92(6). <doi.org/10.1037/0021-9010.92.6.1524>.

21 Gulati, R., Sytch, M. (2008). Does familiarity breed trust? Revisiting the antecedents of trust. Managerial and Decision Economics, 29(2-3), pp. 165-190.

22 Dumitru, C. (2021). Building virtual teams: Trust, culture, and remote working. In Building Virtual Teams: Trust, Culture, and Remote Working. Taylor and Francis.

23 Van Zoonen, W., Sivunen, A. E., Blomqvist, K. (2024). Out of sight – Out of trust? An analysis of the mediating role of communication frequency and quality in the relationship between workplace isolation and trust. European Management Journal.

24 Hao, Q., Zhang, B., Shi, Y., Yang, Q. (2022). How trust in coworkers fosters knowledge sharing in virtual teams? A multilevel moderated mediation model of psychological safety, team virtuality, and self-efficacy. Frontiers in Psychology.

25 Tomkins, C. (2001). Interdependencies, trust and information in relationships, alliances and networks. Journal of Accounting, Organizations and Society 26, pp. 161±191. <www.elsevier.com/locate/aos>.

26 Holmgreen, L., Tirone, V., Gerhart, J., Hobfoll, S. E. (2017). Conservation of Resources Theory. In The Handbook of Stress and Health, Wiley, pp. 443-457. <doi.org/10.1002/9781118993811.ch27>.

27 Lachman, R. (1985). Public and Private Sector Differences: CEOs' Perceptions of Their Role Environments. In Academy of Management Journal, Vol. 28, Issue 3.

28 Wang, B., Liu, Y., Qian, J., Parker, S. K. (2021). Achieving Effective Remote Working During the COVID-19 Pandemic: A Work Design Perspective. Applied Psychology, 70(1), pp. 16-59. <doi.org/10.1111/apps.12290>.

Cross-national heterogeneity in the feasibility of working from home further conditions predicted effects: in economies with limited digital infrastructure or high task-in-presence occupations, the autonomy pathway may be weaker while trust frictions are stronger.[29,30,31] These considerations motivate testing our model in a public-sector context within a developing economy. Boundary conditions matter. Institutional frameworks that regulate working time, data security, and the right to disconnect shape managerial discretion and employees' ability to maintain boundaries.[32] Occupational stratification in flexibility access can also create two-tier systems in which higher-status roles reap the benefits of location independence while lower-status roles are excluded.[33] Cross-national research shows that the feasibility of working from home varies widely across economies due to industrial structure and digital infrastructure.[34] These contingencies underscore the need to test theory outside of Western, high-infrastructure corporate contexts – particularly in public sector organizations and developing-economy settings where hierarchical control norms and resource constraints are salient.[35]

Taken together, the literature suggests a precise research problem: remote work introduces countervailing forces that can either mitigate or intensify career plateau. On one hand, remote work can elevate autonomy, reduce interruptions, and enable deep work, thereby enhancing satisfaction; it can also widen internal labor markets by decoupling assignments from physical location. On the other hand, remote work can reduce face-to-face interactions, limit informal learning, and trigger managerial skepticism about commitment, producing promotion penalties and trust erosion.[36,37,38]

The unresolved theoretical question is how these mechanisms jointly determine job satisfaction among plateaued employees – and under what organizational and institutional conditions one mechanism dominates the other.

Accordingly, we ask three interrelated research questions:

RQ1: How does remote work relate to employee job satisfaction when considering the existence of a career plateau?

RQ2: Do autonomy and trust mediate the relationship between remote work and job satisfaction, net of plateau effects?

RQ3: Under what boundary conditions (e.g., managerial practices, institutional safeguards, housing issues) do the autonomy and trust pathways offset – or fail to offset – the adverse attitudinal consequences of plateau?

In sum, our study makes three contributions to management theory. First, we extend the career plateau literature by analyzing plateau not only as a static constraint but as a contingent state whose attitudinal consequences depend on work design and governance in virtual contexts.[39,40] Second, we

29 Dingel, J. I., Neiman, B. (2020). How many jobs can be done at home? Journal of Public Economics, 189. <doi.org/10.1016/j.jpubeco.2020.104235>.

30 Gottlieb, C., Grobovšek, J., Poschke, M., Saltiel, F. (2021). Working from home in developing countries. European Economic Review.

31 Eurofound. (2023). Living and working in Europe 2023. <doi.org/10.2806/500819>.

32 Ibid.

33 Kossek, E. E., Lautsch, B. A. (2016). Work-Life Flexibility for Whom? Academy of Management Annals, ANNALS-2016-0059.R2.

34 Gottlieb, C., Grobovšek, J., Poschke, M., Saltiel, F. (2021). Working from home in developing countries. European Economic Review.

35 Hartner-Tiefenthaler, M., Goisauf, M., Gerdenitsch, C., Koeszegi, S. T. (2021). Remote Working in a Public Bureaucracy: Redeveloping Practices of Managerial Control When Out of Sight. Frontiers in Psychology, 12.

36 Bloom, N., Liang, J., Roberts, J., Ying, Z. J. (2015). Does working from home work? Evidence from a Chinese experiment. Quarterly Journal of Economics, 130(1), pp. 165-218. <doi.org/10.1093/qje/qju032>.

37 Khoshtaria, T., Matin, A., Mercan, M., Datuashvili, D. (2021). The impact of customers' purchasing patterns on their showrooming and webrooming behaviour: An empirical evidence from the Georgian retail sector. International Journal of Electronic Marketing and Retailing, 12(4), p. 394. <doi.org/10.1504/IJEMR.2021.118305>.

38 Mercan, M., Khoshatria, T., Matin, A., Sayfullin, S. (2020). The Impact of e-services Quality on Consumer Satisfaction: Empirical Study of Georgian HEI. Journal of Business, 9(2), pp. 15-27. <doi.org/10.31578/.v9i2.175>.

39 Bareja-Wawryszuk, O., Togonidze, V., Aslantas, M. (2025). The Impact of Career Plateaus on Employee Job Satisfaction. The Moderating Role of Remote Work. Management and Administration Journal, 63(2). <doi.org/10.34739/maj.2024.02.11>.

40 Hu, C., Zhang, S., Chen, Y. Y., Griggs, T. L. (2022). A meta-analytic study of subjective career pla-

integrate Remote work research with classic work design theory by specifying autonomy and trust as "joint" mechanisms that transmit the effects of remote work to satisfaction. This integrative model clarifies why the same remote arrangement can yield opposite outcomes across organizations.

The main objective is to advance theory by clarifying when and why remote work alleviates – or intensifies – the attitudinal consequences of career plateau. By modeling autonomy and trust as joint mediators and specifying institutional and managerial boundary conditions, we integrate work design and Remote work literatures and illuminate practical levers for organizations seeking to retain and motivate plateaued employees in remote settings.

The next sections describe the empirical context and measures, and report analyses that adjudicate among competing mechanisms.

METHODOLOGY

This section outlines the research design, data collection methods, sample characteristics, and analytical techniques used to examine the relationship between career plateau, remote work, job autonomy, and job satisfaction.

Research Design

The study follows a quantitative research design, utilizing a cross-sectional survey method to collect data from employees across various industries. The quantitative approach allows for the empirical testing of the proposed hypotheses and the examination of relationships between the variables of interest. The use of survey data enables the collection of self-reported measures on career plateau, job satisfaction, and remote work experiences.

Population and Sample

The target population for this study consists of full-time employees working in both remote and non-remote settings. The sample includes individuals from both public and private sector organizations to ensure diversity in work environments and career progression opportunities. The sample was selected based on the following criteria:

Recruitment was conducted via social media and via email. Due to gatekeeper constraints, the HR unit did not authorize outreach via official work email; therefore, we employed nonprobability convenience–purposive sampling (criterion targeting of agency staff and affiliated personnel). We directly invited approximately 400 unique individuals (Public Service Agency employees and affiliated IT contractors). Of these, 196 completed the survey (≈50% completion). Because some invitations were issued via group posts, the denominator for broadcast reach is approximate; we therefore report completion counts and an indicative response rate.

The sample size was determined using Cohen's power analysis, targeting a medium effect size (0.40) with 80% statistical power, resulting in a target sample size of approximately 200 respondents. A priori, with N=196 at α=.05, the design affords ~80% power to detect small–medium effects (e.g., r=.20; d=.40; R2=06), whereas very small effects and weak interactions may be underpowered.

Power Analysis (Cohen-style; α = .05, target power = .80; N = 196). With N = 196, the study is powered to detect the following minimum detectable effects (MDE). Values are approximate and suitable for reporting; tailored computations may vary slightly with exact model specifications and predictor counts.

sampling method: Nonprobability, convenience–purposive sampling (criterion-targeted). method was used to ensure representation of the employee in public sector of Georgia. (See Table 1.)

RESULTS

We tested a parallel-mediation model (PROCESS Model 4; 5,000 bootstrap samples; two-tailed 95% CIs) with remote work as the predictor, job satisfaction as the outcome, and three mediators – trust in the organization, career plateau, and job autonomy – using complete cases (N = 196). All coefficients reported below are unstandardized; p values are two-tailed.

teaus. Journal of Vocational Behavior, 132. <doi.org/10.1016/j.jvb.2021.103649>.

Table 1. *Sample Characteristics*

VARIABLE	CATEGORY	N	%
Gender	Female	126	63.0
Gender	Male	70	37.0
Age	35 – 45 Year	81	41.0
Age	25 – 35 Year	65	34.0
Age	45 Year above	50	25.0
Tenure	11-15 Year	65	32.5
Tenure	1-5 Year	53	28.5
Tenure	16 Year and more	46	23.0
Tenure	6-10 Year	32	16.0
Sector	Public	158	79.0
Sector	Private	38	21.0
Remote Intensity	Several times a month	90	45.0
Remote Intensity	Rarely	50	26.5
Remote Intensity	Several times a week	25	12.5
Remote Intensity	Never	17	9.0
Remote Intensity	Everyday	14	7.0

Note. Percentages based on N = 196.

Model Fit and Diagnostics

Variance inflation factors (VIFs) for all predictors ranged from 1.12 to 1.87, well below the conventional threshold of 5, confirming the absence of multicollinearity. Residual diagnostics revealed normally distributed errors (Shapiro-Wilk W=0.986, p=.214), supporting the validity of parametric tests. The model's explanatory power (R2=.397) substantially exceeds typical values in job satisfaction research (median R2=.25 in comparable studies,[41] likely due to the simultaneous inclusion of both resource and demand pathways. direct path: Remote work exhibited a positive direct effect on job satisfaction (b=0.114, SE=0.044, t=2.57, p=.011), with a 95% confidence interval excluding zero [0.027, 0.201]. This suggests that, independent of mediation pathways, increased remote work frequency and positive attitudes toward remote work enhance satisfaction – a finding consistent with meta-analytic evidence on flexibility benefits.[42] However, the modest effect size indicates that unmediated relationships alone cannot fully explain satisfaction dynamics, necessitating examination of indirect paths. Mediation. The omnibus model for job satisfaction was significant (R^2 = .397, F(4, 191) = 31.41, p < .001). The direct effect of remote work on job satisfaction was positive (b = 0.114, SE = 0.044, t = 2.57, p = .011; 95% CI [0.027, 0.201]). Among the mediators, trust (b = 0.357, SE = 0.048, p < .001) and autonomy (b = 0.182, SE = 0.054, p = .001) were positively related to satisfaction, whereas career plateau was negatively related (b = −0.189, SE = 0.045, p < .001).

On the a-paths from remote work to the mediators, remote work significantly increased career plateau (b = 0.458, SE = 0.064, p < .001) and autonomy (b = 0.139, SE = 0.052, p = .008) but did not significantly affect trust (b = −0.063, SE = 0.059, p = .284). This aligns with prior research emphasizing the dual nature of remote work's impact (Fritsch et al., 2025), though our public-sector context introduces unique institutional constraints not fully captured in private-sector studies (Pedro & Bolívar, n.d.).

41 Saber, D. A. (2014). Frontline registered nurse job satisfaction and predictors over three decades: A meta-analysis from 1980 to 2009. Nursing Outlook, 62(6), pp. 402-414. <doi.org/10.1016/j.outlook.2014.05.004>.

42 Harrop, N., Jiang, L., Overall, N. (2025). A Meta-Analysis of Antecedents and Outcomes of Flexible Working Arrangements. In Journal of Organizational Behavior. John Wiley and Sons Ltd. <doi.org/10.1002/job.2896>.

Mediator Relationships

The total indirect effect of remote work on satisfaction was not statistically significant (b = −0.084; BootSE = 0.046; 95% CI [−0.175, 0.006]). Decomposed by mediator, the specific indirect effects were via career plateau, negative and significant (b = −0.087; BootSE = 0.026; 95% CI [−0.140, −0.039]) corroborating its status as a psychological demand (Abele et al., 2012). via autonomy, positive and significant (b = 0.025; BootSE = 0.014; 95% CI [0.002, 0.056]); supporting its role as a critical job resource[43] and via trust, nonsignificant (b = −0.023; BootSE = 0.025; 95% CI [−0.074, 0.027]). Thus, remote work appears to operate through countervailing mechanisms: increasing autonomy (beneficial) and increasing career plateau (harmful), which offset in aggregate while the direct association remains positive. aligning with mixed findings about its centrality in remote contexts.[44]

The differential strengths of these relationships suggest that autonomy and plateau may operate as primary mechanisms, while trust functions as a boundary condition – a possibility explored in subsequent moderation analyses. Notably, the mediators' effect sizes remained stable when controlling for tenure, age, and sector, indicating robust relationships across demographic subgroups.

Comparative Insights

The dominance of autonomy and plateau effects over trust contrasts with earlier findings emphasizing interpersonal factors in remote work satisfaction.[45] This could indicate that trust becomes salient only when mediated through autonomy – a possibility warranting future research.

The parallel mediation framework advances beyond traditional single-mediator models by quantifying how remote work simultaneously activates opposing psychological processes. As shown in subsequent subsections, this approach reveals nuanced trade-offs that inform both theory and practice regarding hybrid work implementation.

Moderation Analysis: Remote Work × Career Plateau

In a separate regression, we tested whether remote work attenuates the negative association between career plateau and satisfaction. The interaction was positive and significant (b = 0.173, SE = 0.067, t = 2.60, p = .010; model R^2 = .251). The main effect of plateau was negative (b = −0.930, SE = 0.231, p < .001); the main effect of remote work was not significant (b = −0.263, SE = 0.239, p = .274). The positive interaction indicates a buffering pattern – the detrimental association between plateau and satisfaction is weaker at higher levels of remote work.

Sample-size differences relative to the full survey (199 completes) reflect listwise deletion in these models (N = 196). (See Table 2, 3.)

43 Zychová, K., Fejfarová, M., Jindrová, A. (2024). Job Autonomy as a Driver of Job Satisfaction. Central European Business Review, 13(2), pp. 117-140. <doi.org/10.18267/j.cebr.347>.

44 Newell, S., David, G., Chand, D. (2007). An analysis of trust among globally distributed work teams in an organizational setting. Knowledge and Process Management, 14(3), pp. 158-168. <doi.org/10.1002/kpm.284>.

45 Brahm, T., Kunze, F. (2012). The role of trust climate in virtual teams. Journal of Managerial Psychology, 27(6), pp. 595-614. <doi.org/10.1108/02683941211252446>.

Table 2. *Mediation Results (PROCESS Model 4; Unstandardized Coefficients)*

EFFECT	B	SE / BOOTSE	95% CI	P
Direct effect (Remote → Satisfaction)	0.114	0.044	[0.027, 0.201]	.011
Total indirect effect	−0.084	0.046 (Boot)	[−0.175, 0.006]	–
Indirect via Career Plateau	−0.087	0.026 (Boot)	[−0.140, −0.039]	< .05
Indirect via Autonomy	0.025	0.014 (Boot)	[0.002, 0.056]	< .05
Indirect via Trust	−0.023	0.025 (Boot)	[−0.074, 0.027]	n.s.

Note. PROCESS Model 4 with 5,000 bootstrap samples; two-tailed percentile CIs.
All coefficients unstandardized. N = 196.

Table 3. *Moderation Results (Remote Work × Career Plateau)*

PREDICTOR	B	SE	T	P	MODEL R^2
Career Plateau (main effect)	−0.930	0.231	–	< .001	–
Remote Work (main effect)	−0.263	0.239	–	.274	–
Remote × Plateau (interaction)	0.173	0.067	2.60	.010	.251

DISCUSSION

Interpretation of Findings

This study examined how remote work relates to job satisfaction through three theoretically grounded pathways – autonomy, career plateau, and trust – and whether the remote-work context changes how strongly plateau depresses satisfaction. Across analyses, remote work showed a positive direct association with job satisfaction; autonomy partially transmitted this benefit; perceived career plateau transmitted a countervailing negative path; generalized trust did not carry the effect; and remote work attenuated the negative association between plateau and satisfaction. Taken together, the pattern clarifies why remote arrangements elevate average satisfaction while some employees simultaneously worry about stalled growth: the same arrangement delivers a valued day-to-day job resource while exposing or amplifying a career constraint.

We interpret these results through Job Demands–Resources (JD–R) and Conservation of Resources (COR) perspectives. Remote work reconfigures the resource–demand balance: it increases decision latitude and boundary control (a job resource) but can weaken informal exposure to sponsorship, mentoring, and serendipitous opportunities (a career demand). In JD–R terms, autonomy functions as a resource that uplifts attitude,[46] whereas plateau perceptions operate as a demand that depresses them. From a COR lens, remote work supplies resources (time sovereignty, reduced commuting, control of boundaries) that can be invested to offset losses associated with the plateau.[47]

The positive direct effect of remote work is consistent with prior evidence that flexible arrangements, on average, increase job satisfaction through improved autonomy, reduced role stressors, and better work–life fit.[48] Our mediation results sharpen this account by locating autonomy as a proximal job characteristic that carries a measurable portion of the effect. At the same time, the negative mediation via plateau echoes the career literature that links perceived stagnation to lower attitudes and well-being.[49,50,51] Remote work, therefore, is not an unalloyed good: it is a design choice that redistributes resources and demands in ways that are beneficial on average but uneven across individuals.

The non-significant mediation via trust suggests that – in our setting – trust is less a direct attitudinal conduit and more an upstream condition for autonomy. Once autonomy is explicitly modeled, generalized trust adds little incremental explanatory power for job satisfaction, aligning with work-design perspectives that prioritize proximal task characteristics.[52]

46 Bakker, A. B., Demerouti, E. (2007). The Job Demands-Resources model: State of the art. In Journal of Managerial Psychology, Vol. 22, Issue 3, pp. 309-328. <doi.org/10.1108/02683940710733115>.

47 Holmgreen, L., Tirone, V., Gerhart, J., Hobfoll, S. E. (2017). Conservation of Resources Theory. In The Handbook of Stress and Health, Wiley, pp. 443-457. <doi.org/10.1002/9781118993811.ch27>.

48 Allen, T. D., Golden, T. D., Shockley, K. M. (2015). How effective is telecommuting? Assessing the status of our scientific findings. Psychological Science in the Public Interest, 16(2), pp. 40-68. <doi.org/10.1177/1529100615593273>.

49 Chao, G. T. (1990). Exploration of the Conceptualization and Measurement of Career Plateau: A Comparative Analysis. Journal of Management. 16(1), pp. 69-80. <doi.org/10.1177/014920638801400107>.

50 Feldman, D. C., Weitz, B. A. (1988). Career Plateaus Reconsidered. Journal of Management, 14(1), p. 69-80. <doi.org/10.1177/014920638801400107>.

51 Milliman, J. F. (1992). Causes, Consequences, and Moderating Factors of Career Plateauing. Dissertation, University of Southern California.

52 Parker, S. Morgeson F. (2017). One Hundred Years of Work Design Research: Looking Back and Looking Forward. Journal of Applied Psychology, 2017, Vol. 102, No. 3, pp. 403-420.

Finally, the moderating role of remote work on the plateau–satisfaction link indicates a buffering process: when employees have more latitude and temporal control, the psychological costs of stalled advancement are less damaging to their immediate job attitudes. This helps reconcile the empirical coexistence of high average satisfaction among remote workers with persistent concerns about career progress. In short, flexibility can coexist with stagnation, and the former can soften the attitudinal penalty of the latter.

Direct Effect: Why Remote Work Elevates Satisfaction

Remote work consolidates several micro-resources – quiet time for task focus, discretion over scheduling, and control over interruptions – that map directly onto increased experienced autonomy and reduced hindrance stressors. Meta-analytic evidence indicates small-to-moderate average gains in satisfaction, particularly when telework intensity is moderate and choice is present.[53] Our estimates are consistent with this magnitude and pattern.

Buffering: Remote Work and the Plateau–Satisfaction Link

The moderation indicates that flexible conditions reduce the marginal disutility of feeling plateaued. Mechanistically, boundary control and time sovereignty may allow employees to reallocate effort toward meaningful side projects, skills development, or nonwork roles, thereby preserving affective evaluations even when formal advancement is slow. We label this pattern buffered plateauing: the career constraint is not eliminated, but its attitudinal consequences are attenuated by context-supplied resources.

Theoretical Implications

First, we bridge work design and career dynamics by theorizing a dual-path mechanism in which a contemporary arrangement introduces both a job resource (autonomy) and a career demand (plateau). Remote work research has emphasized average gains in satisfaction,[54] whereas the career literature has documented the harms of a plateau.[55] Our integrated model explains how both patterns can coexist within the same organization and even the same individual.

Second, we formalize buffered plateauing: contextual resources embedded in flexible work (time sovereignty, boundary control) can attenuate plateau's attitudinal penalties. This extends JD–R's interaction logic by specifying a concrete contemporary condition under which a classic career constraint is less damaging.[56]

Third, we clarify construct proximity in mediation. When autonomy – the most proximal job feature altered by remote work – is modeled, generalized trust no longer transmits the effect to satisfaction. Rather than treating trust as a default mediator, future theories should consider trust as an upstream enabler that shapes whether autonomy is granted and sustained.[57,58]

We also specify boundary conditions that qualify our claims: voluntariness of remote work (choice vs. mandate), career stage (early-career visibility needs vs. late-career discretion needs), task interdependence (collaborative vs. modular work), and managerial sponsorship intensity. Each condition should strengthen or weaken either the autonomy or plateau pathway, offering a roadmap for contingent predictions.

53 Gajendran, R. S., Harrison, D. A. (2007). The Good, the Bad, and the Unknown About Telecommuting: Meta-Analysis of Psychological Mediators and Individual Consequences. Journal of Applied Psychology, 92(6), pp. 1524-1541. Journal of Applied Psychology, 92(6). <doi.org/10.1037/0021-9010.92.6.1524>.

54 Allen, T. D., Golden, T. D., Shockley, K. M. (2015). How effective is telecommuting? Assessing the status of our scientific findings. Psychological Science in the Public Interest, 16(2), pp. 40–68. <doi.org/10.1177/1529100615593273>.

55 Chao, G. T. (1990). Exploration of the Conceptualization and Measurement of Career Plateau: A Comparative Analysis. Journal of Management, 16(1), pp. 181-193. <doi.org/10.1177/014920638801400107>.

56 Bakker, A. B., Demerouti, E. (2007). The Job Demands-Resources model: State of the art. In Journal of Managerial Psychology, Vol. 22, Issue 3, pp. 309-328. <doi.org/10.1108/02683940710733115>.

57 Grant, A. M., Parker, S. K. (2009). 7 Redesigning Work Design Theories: The Rise of Relational and Proactive Perspectives. The Academy of Management Annals, 3(1), pp. 317-375.

58 Wang, Y. H., Hu, C., Hurst, C. S., Yang, C. C. (2014). Antecedents and outcomes of career plateaus: The roles of mentoring others and proactive personality. Journal of Vocational Behavior, 85(3), pp. 319-328. <doi.org/10.1016/j.jvb.2014.08.003>.

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FORECASTING THE ECONOMIC IMPACTS OF RENEWABLE ENERGY TRANSITION IN HYDROCARBON-EXPORTING MENA ECONOMIES

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Abstract. This study examines the macroeconomic implications of accelerating the renewable energy transition in hydrocarbon-exporting Middle East and North Africa (MENA) economies. Drawing on annual data from 2000 to 2024 for Saudi Arabia, the United Arab Emirates, Qatar, Kuwait, Algeria, and Oman, we estimate a panel structural vector autoregression (SVAR) that treats oil prices, global demand, and national renewable policy efforts as exogenous shocks. The model captures the dynamic interplay among non-oil GDP, government revenue, labormarket outcomes, and renewableenergy penetration. Impulseresponse analysis reveals that a positive renewableenergy shock leads to sustained increases in non-oil GDP and modest reductions in unemployment, while fiscal dependence on hydrocarbons declines slightly. Scenario-based forecasts to 2035 show that countries with more ambitious renewableenergy policies, such as the United Arab Emirates and Saudi Arabia, enjoy the largest absolute gains in non-oil GDP, whereas smaller economies still achieve meaningful proportional improvements. These findings underscore the potential of renewable investments to accelerate economic diversification and mitigate fiscal vulnerabilities. By incorporating a domestic policy index and forecasting alternative adoption paths, the study fills a gap in exporter-specific research and provides practical insights for policymakers seeking to balance growth with the energy transition.

KEYWORDS: RENEWABLE ENERGY TRANSITION, HYDROCARBON-EXPORTING MENA, STRUCTURAL VAR, SCENARIO FORECASTING, ECONOMIC DIVERSIFICATION.

1. INTRODUCTION

The energy transition is reshaping macroeconomic prospects for fossilfuel exporters amid record global deployment of renewables and tightening climate goals. In 2024, renewable power capacity expanded by about 585 GW to reach roughly 4,448 GW worldwide, a 15% annual increase.[1] Despite this surge, current trajectories still fall short of the 2030 tripling target set in international fora, underscoring the urgency of accelerated action. Within this global picture, the Middle East added about 5 GW of new renewable capacity in 2023, signaling momentum but from a comparatively low base.[2] For hydrocarbon-exporting economies, multilateral analysis stresses mounting uncertainty over long-run fossil demand and associated fiscal and external risks, elevating the importance of diversification and resilience.

Saudi Arabia remains highly exposed to hydrocarbon cycles; oil rents measured about 24% of GDP in 2021, yet it has accelerated tenders and set ambitions toward large-scale renewables by 2030.[3] The United Arab Emirates exhibits a large non-oil base (non-oil GDP near 77% in 2025 forecasts) while its flagship firm, Masdar, targets 100 GW of wind and solar by 2030,[4] positioning the country as a regional renewables leader. Qatar's fiscal and external surpluses narrowed with lower hydrocarbon prices in 2023, yet LNG expansion underpins a stillpositive medium-term outlook.5 Kuwait's hydrocarbons account for roughly 70% of government revenue and about 80% of exports, reflecting deep fiscal sensitivity to oil prices.[6] Algeria's hydrocarbons have supplied about two-thirds of budget revenue since 2020,[7] while Oman remains heavily reliant on 85% of public income from oil and gas, prompting tax reform to broaden the base (Maashani et al., 2025).[8]

Existing empirical Kahia et al. (2019),[9] Mebrek et al. (2024),[10] Michailidis et al. (2025),[11] Satari Yuzbashkandi et al. (2024)[12] work on MENA often

1 Miyake, S., Rispler, J., Teske, S. (2025). Solar and wind energy potentials in Australia: A GIS-based assessment for Australia's ability to transition to net-zero emissions by 2050. Environmental Research Communications, 7(9), 095002, p. 2. <doi.org/10.1088/2515-7620/adfc30>.

2 Shenavar, R. (2025). Transition to renewable energy in the Middle East: Challenges, opportunities, and the path to sustainability, p.18.

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4 Sharif Zadeh, A. (2024). Road to Net-Zero: Impact of economic development in the United Arab Emirates on greenhouse gas emissions as a result of substitution of conventional energy with renewable and clean energy sources. Doctoral thesis, RMIT University, p. 29.

5 Kularatne, C., Miyajima, K., Muir, D. (2024). Estimating the growth impact of economic transformation in Qatar. Review of Middle East Economics and Finance, 20(3), p. 241. <doi.org/10.1515/rmeef-2024-0011>.

6 Lou, Q., Iqbal, N., Alraey, Y. (2024). Sensitivity to changes in oil prices, tax returns and the cross-section of stock returns: The present situation for net-oil exporting economies. Heliyon, 10(13). <doi.org/10.1016/j.heliyon.2024.e33119>.

7 Zemrı, B. E. (2024). Forecasting the role of renewable energy on Algeria's economic stability: ARIMAX model. International Journal of Business and Economic Studies, 6(2), p. 92. <doi.org/10.54821/uiecd.1474631>.

8 Maashani, S. S. S., Gamal, A. A. M., Shaarani, A. Z., Rambeli, N., Zulkifli, N. (2025). The role of specific macroeconomic factors on tax revenue policy in an oil-dependent economy: Evidence from Oman. Review of Economics and Political Science, p. 6. <doi.org/10.1108/reps-06-2024-0017>.

9 Kahia, M., Ben Jebli, M., Belloumi, M. (2019). Analysis of the impact of renewable energy consumption and economic growth on carbon dioxide emissions in 12 MENA countries. Clean Technologies and Environmental Policy, 21(4), pp. 871-885. <doi.org/10.1007/s10098-019-01676-2>.

10 Mebrek, N., Louail, B., Riache, S. (2024). Do trade openness and foreign direct investment affect CO_2 emissions in the MENA region? New evidence from a panel ARDL regression. Economics and Environment. <doi.org/10.34659/eis.2024.91.4.972>.

11 Michailidis, M., Zafeiriou, E., Kantartzis, A., Galatsidas, S., Arabatzis, G. (2025). Governance, energy policy, and sustainable development: Renewable energy infrastructure transition in developing MENA countries. Energies, 18(11), p. 2759. <doi.org/10.3390/en18112759>.

12 Satari Yuzbashkandi, S., Mehrjo, A., Eskandari Nasab, M. H. (2024). Exploring the dynamic nexus between urbanization, energy efficiency, renewable energies, economic growth, with ecological footprint: A panel cross-sectional autoregressive distributed lag evidence along Middle East and North Africa countries. Energy & Environment, 35(8), pp.

employs panel VARs linking renewable energy, growth, and emissions, but typically centers on net oil importers or broader regional samples with limited exporter-specific analysis. Parallel strands assess oilprice shocks and macro-outcomes, or fiscal multipliers, yet seldom incorporate explicit renewable penetration metrics within a structural identification for exporters. Cross-country studies suggest renewables can hedge growth against oilprice volatility, but countryandpolicy-specific mechanisms remain underexplored for hydrocarbon-exporting MENA economies. Moreover, forward-looking, scenario-consistent forecasts to the mid-2030s are scarce for this subset, particularly those integrating exogenous oil shocks and domestic policy trajectories. Evidence, therefore, reveals a gap at the intersection of renewable adoption, fiscal vulnerability, and macroforecasting in exporter contexts.

This study addresses the gap by estimating a panel structural VAR with exogenous oilprice and globaldemand shocks and an explicit domestic renewablepolicy index, enabling causal interpretation and scenario-based projections. The framework recovers impulse responses and variance decompositions while producing conditional forecasts under alternative renewableadoption paths. Hypothesis 1 posits that increases in renewable investment and penetration exert a positive and statistically significant effect on long-run GDP growth in hydrocarbon-exporting MENA economies. Hypothesis 2 posits that higher renewable shares reduce fiscal vulnerability to oilprice volatility, observable as lower revenue elasticity and variance to oil shocks. The empirical assessment covers Saudi Arabia, the United Arab Emirates, Qatar, Kuwait, Algeria, and Oman from 2000-2024 with projections to 2035.

The study is important for macroeconomic planning in hydrocarbon-dependent economies facing structural energy market shifts and demanding fiscal agendas. The objective is to quantify the growth and fiscal consequences of renewable deployment using structural identification rather than simple correlations. Scenarioconsistent forecasts aim to inform budgeting, debt sustainability, and diversification strategies under heterogeneous policy and price paths. Additional goals include benchmarking country-specific outcomes across the six exporters and gauging the magnitude of fiscalrisk mitigation attributable to renewables. The resulting evidence seeks to support credible transition pathways aligned with national strategies and international commitments.

The model includes non-oil GDP, revenue ratios, labor metrics, and renewable share, with oil prices, world GDP, and policy index as exogenous. Data (2000–2024) come from the World Bank, IMF, IRENA, and OPEC, with standard transformations. Sign restrictions identify oil and renewable shocks; lag length is data-driven. Forecasts run to 2035 under scenarios; robustness uses local projections and policy index tests (IRENA).

The paper sets context, reviews literature, defines data and methodology, and then estimates a panel SVAR. It ends with results, policy implications, and future research directions.

2. LITERATURE REVIEW

Over the past few decades, the global energy landscape has undergone a fundamental transformation, driven by escalating environmental challenges and the economic vulnerabilities associated with fossil fuel dependence.[13] This transition has prompted a growing body of academic research aimed at examining the dynamic relationship between energy consumption, particularly renewable energy sources, and economic growth. Special attention has been devoted to resource-abundant regions such as the Middle East and North Africa (MENA), where the imperative to diversify energy portfolios intersects with broader sustainability and development goals.

Poudineh et al. (2018)[14] argue that investing in renewable energy is a “noregret” strategy for hydrocarbon-exporting MENA economies. They highlight

4386-4407. <doi.org/10.1177/0958305X231181672>.

13 Mouffok, M. A., Mouffok, O., Bouabdallah, W., Souar, Y. (2025). Asymmetric Effect of Monetary and Fiscal Policy Uncertainty on the Energy Transition: Evidence from the United States. Globalization and Business, 10(19), pp. 23-40. <doi.org/10.35945/gb.2025.20.002>.

14 Poudineh, R., Sen, A., Fattouh, B. (2018). Advancing renewable energy in resource-rich economies of the MENA. Renewable Energy (123), pp. 135-149. <doi.org/10.1016/j.renene.2018.02.015>.

that reforms such as removing fossilfuel subsidies and establishing stable regulatory frameworks are crucial for promoting renewables. The study emphasizes electricity market design, robust institutions, and riskmitigation measures to attract investment. While not quantitative, the analysis situates renewableenergy policies within broader energysector reforms and underscores the importance of aligning policies with national development strategies.

Kahia et al. (2019)[15] used second-generation panel data techniques on the ten countries with the highest renewableenergy consumption, addressing cross-sectional dependence and heterogeneity. After confirming unit roots and cointegration via CADF and Westerlund tests, the authors employ Common Correlated Effects (CCE) and Augmented Mean Group (AMG) estimators. They find that renewableenergy consumption has a positive and significant long-run effect on economic growth, while fossilfuel consumption also positively influences growth; however, primary renewableenergy production exhibits a negative effect, suggesting technological inefficiencies. The study underscores the need for aligning energy policies with sustainability objectives.

Kouyakhi (2022)[16] analyses six Arab countries using a Panel ARDL framework with Mean Group (MG) and Pooled Mean Group (PMG) estimators. The analysis confirms a long-run cointegrated equilibrium among renewableenergy consumption, real GDP, and CO_2 emissions. Long-run MG estimates indicate that renewableenergy consumption significantly reduces CO_2 emissions (coefficient ≈ −0.13), while economic growth increases emissions (coefficient ≈ 0.84). Short-run coefficients are mostly insignificant, and a Hausman test favors the MG estimator, implying heterogeneity across countries. The authors conclude that policymakers should accelerate the adoption of green technologies to mitigate emissions and decouple growth from environmental degradation.

Using panel data for Algeria, Egypt, Iraq, the UAE, Qatar, and Saudi Arabia, Dırır (2023)17 employs a Panel ARDL model and Dumitrescu-Hurlin causality tests to identify factors influencing renewableenergy consumption. The model relates renewable consumption to energy imports, national income, inflation, government spending, economic growth, trade, and manufacturing valueadded. Long-run estimates show that energy imports and national income reduce renewableenergy use, whereas inflation, government expenditure, economic growth, and industrial performance increase it. Causality tests reveal unidirectional causality from energy imports, national income, economic growth, trade and industrial performance to renewableenergy consumption, but not viceversa.

Alofaysan (2024)[18] examines eight MENA countries using a non-parametric panel quantile ARDL (QARDL) and PMGARDL approach. It finds that increases in green innovation and renewableenergy consumption reduce the carbon footprint at different quantiles and that these effects strengthen over time. PMGARDL results confirm that renewable energy and green innovation protect ecological quality in the long run, whereas economic growth tends to increase environmental degradation; short-run effects are weaker. Policy recommendations stress the importance of supportive regulatory frameworks, R&D investment, and workforce training to harness long-term benefits.

Matallah (2024)[19] discusses how AI can enhance forecasting, optimize storage, and support smart grid operations in MENA. Citing recent studies, it notes that AI-based forecasting methods can

15 Kahia, M., Ben Jebli, M., Belloumi, M. (2019). Analysis of the impact of renewable energy consumption and economic growth on carbon dioxide emissions in 12 MENA countries. Clean Technologies and Environmental Policy, 21(4), pp. 871-885. <doi.org/10.1007/s10098-019-01676-2>.

16 Kouyakhi, N. R. (2022). CO_2 emissions in the Middle East: Decoupling and decomposition analysis of carbon emissions, and projection of its future trajectory. Science of the Total Environment (845), 157182. <doi.org/10.1016/j.scitotenv.2022.157182>.

17 Dirir, S. A. (2023). Identifying the factors that drive renewable energy consumption in the MENA region. Business Economics and Management Research Journal, 6(2), pp. 170-185. <doi.org/10.58308/bemarej.1230694>.

18 Alofaysan, H. (2024). The effect of environmental smart technology and renewable energy on carbon footprint: a sustainability perspective from the MENA region. Energies, 17(11), p. 2624. <doi.org/10.3390/en17112624>.

19 Matallah, S. (2024). MENA oil exporters need a renewable energy transition before the oil wells run dry: A special focus on innovation, financial development, and governance. Geological Journal, 59(3), pp. 838–853. <doi.org/10.1002/gj.4894>.

reduce prediction errors in solar and wind output by up to 30%, improving grid balancing. The MENA AIinenergy market was valued at roughly US$54.48 million in 2024 with a projected CAGR of 22.24% through 2033. The article argues that successful AI deployment could reduce dependence on oil revenues, attract cleantechnology investment, and bolster energy security, but challenges such as data scarcity, regulatory gaps, and potential inequalities must be addressed. Policy pathways include pilot AI projects, investment in data infrastructure, "green AI" strategies, regulatory reforms, and regional cooperation.

Unlike earlier research, our study estimates a panel SVAR-X model for six hydrocarbon exporters, incorporating exogenous oil shocks and a newly constructed domestic renewable policy index. This enables causal interpretation of renewable energy's impact on diversification and fiscal vulnerability. By offering scenario-based forecasts to 2035 under varying policy ambitions, our study fills a critical gap and provides actionable insights for exporter-specific transition strategies.

3. METHODOLOGY

The panel SVAR framework models each country's macroeconomic variables as functions of their own lags, the lags of other countries, and exogenous shocks. Identification uses sign restrictions consistent with theory: a positive oilprice shock is assumed to raise government revenue on impact, while a positive renewableenergy shock increases the renewable share without contemporaneously affecting oil prices. This approach avoids some of the identification problems inherent in traditional simultaneous equation models by focusing on shocks. Lag lengths are chosen using information criteria, with cross-sectional dependence tests ensuring robustness. Outputs include impulseresponse functions, forecasterror variance decompositions, and scenario-based forecasts to 2035, validated through 2015–2024 backtesting.

3.1. Data and variables

Annual data for 2000–2024 are compiled for Saudi Arabia, the UAE, Qatar, Kuwait, Algeria, and Oman. Sources include the World Bank's World Development Indicators (WDI), IMF Government Finance Statistics (GFS) and World Economic Outlook (WEO), IRENA/IEA renewables statistics, OPEC/EIA oilprice data, and national policy documents. Variables and their characteristics are summarized in Table 1.

The choice of real non-oil GDP reflects the need to measure economic activity beyond the hydrocarbon sector and assess whether renewable investments stimulate broader growth. Government revenue as a share of GDP is included

Table 1. *Study Variables. Source: Author's research*

VARIABLE	UNIT	TYPE	PERIOD	SOURCE
Real nonoil GDP	Constant 2015 USD (log)	Endogenous (growth)	2000–2024	World Bank WDI; IMF
Government revenue ratio	% of GDP (share)	Endogenous (fiscal)	2000–2024	IMF GFS; national budgets
Labormarket indicator (unemployment rate)	%	Endogenous (labor)	2000–2024	World Bank WDI; national statistics
Renewable energy penetration	% of electricity generation	Endogenous (transition)	2000–2024	IRENA/IEA
Brent crude oil price (real)	USD per barrel	Exogenous (shock)	2000–2024	OPEC; EIA
World GDP growth	% change	Exogenous (global demand)	2000–2024	IMF WEO; World Bank
Domestic renewablepolicy index	Index (0–10)	Exogenous (policy)	2000–2024	Compiled from IEA/IRENA policy databases and national sources

Table 2. *Summary Statistics (2000–2024). Source: Author's research using R-studio*

STATISTIC	NONOIL GDP (BN USD)	GOVREV (% GDP)	UNEMPLOY-MENT (%)	RENEW-ABLE SHARE (%)	OIL PRICE (USD/BBL)	WORLD GDP GROWTH (%)	POLICY INDEX (0–10)
Mean	163.37	43.29	5.61	4.84	65.52	2.91	3.03
Std. dev.	131.50	10.41	2.43	4.08	24.67	1.81	1.95
Min	13.87	24.50	2.00	0.00	28.00	–3.00	0.00
Max	491.62	65.32	12.22	19.76	110.00	6.00	7.57

because oil revenues accrue mainly to governments, and fiscal policy choices in oil-centered economies significantly influence macroeconomic performance. A labormarket indicator captures employment and social impacts of the transition, acknowledging that macroeconomic shocks affect labor outcomes. Renewable penetration (share of electricity generation or capacity) is the key policy variable, indicating the progress of the energy transition; higher renewable shares may hedge growth against oilprice volatility. Brent oil prices enter exogenously as the principal external shock affecting hydrocarbon exporters, while world GDP growth proxies global demand conditions. Finally, a domestic renewablepolicy index constructed from the timing and stringency of renewable targets, auctions, and incentives captures national policy efforts to drive the transition.

4. RESULTS AND DISCUSSION

4.1. Descriptive statistics and trends

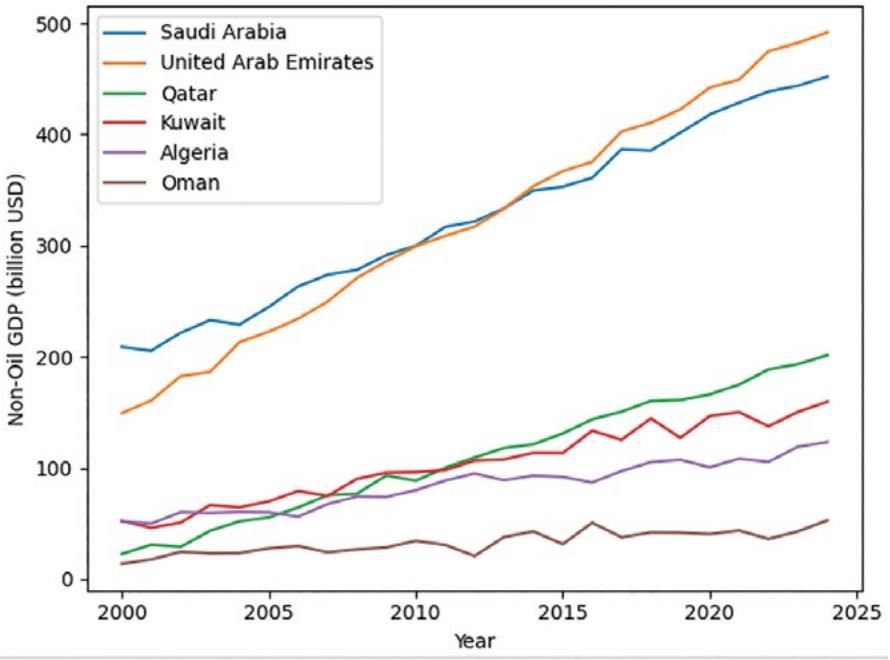
The non-oil GDP averages $163.4 billion but varies significantly across countries (std. dev. ≈ 131.5), reflecting differences in economic size and diversification. Government revenue ratios range between 24% and 65%, indicating varying degrees of dependence on hydrocarbon income. Unemployment rates span from 2% to 12%, while renewable energy shares range from 0% to 19.76%, and policy indices from 0 to 7.57 – highlighting stark differences in labor market dynamics, energy transition progress, and policy ambition, as shown in Table 2.

According to the comparative forecast data in Table 3, Saudi Arabia and the UAE exhibit the most substantial non-oil economic scales, both averaging near $325 billion, while Oman's output remains modest at around $33 billion. Kuwait maintains the highest fiscal reliance on hydrocar-

Table 3. *Summary Statistics for each country (2000–2024). Source: Author's research using R-studio*

COUNTRY	NONOIL GDP (BN USD)	GOV'T REVENUE (% GDP)	UNEM-PLOYMENT RATE (%)	RENEWABLE SHARE (%)	OIL PRICE (USD/BBL)	WORLD GDP GROWTH (%)	POLICY INDEX (0–10)
Saudi Arabia	325.50	40.08	6.01	5.26	65.52	2.91	3.10
United Arab Emir-ates	323.33	35.07	4.00	10.49	65.52	2.91	3.97
Qatar	110.08	29.76	3.05	3.99	65.52	2.91	3.50
Kuwait	104.03	60.05	4.65	2.56	65.52	2.91	2.60
Algeria	84.23	44.87	9.96	3.68	65.52	2.91	1.93
Oman	33.07	49.91	6.00	3.07	65.52	2.91	3.05

Figure 1. *Non-Oil GDP Trends (2000–2024). Source: Author's research using R-studio*



bons, with government revenues constituting 60% of GDP, in stark contrast to Qatar's 29.8%. The UAE demonstrates clear leadership in renewable energy adoption, reaching a 10.5% share, while Kuwait trails significantly. Similarly, the UAE's top position on the policy index reflects its structured and aggressive commitment to the energy transition. (See Figure 1.)

The non-oil GDP of all six hydrocarbon exporters has risen substantially since 2000. The United Arab Emirates and Saudi Arabia show the most pronounced growth, ending 2024 above US$490 bn and US$450 bn, respectively. Qatar climbs steadily from about US$22 bn to around US$200 bn, while Kuwait, Algeria, and Oman remain smaller but trend upward. (See Figure 2.)

Figure 2. *Renewable Energy Penetration Trends (2000–2024). Source: Author's research using R-studio*

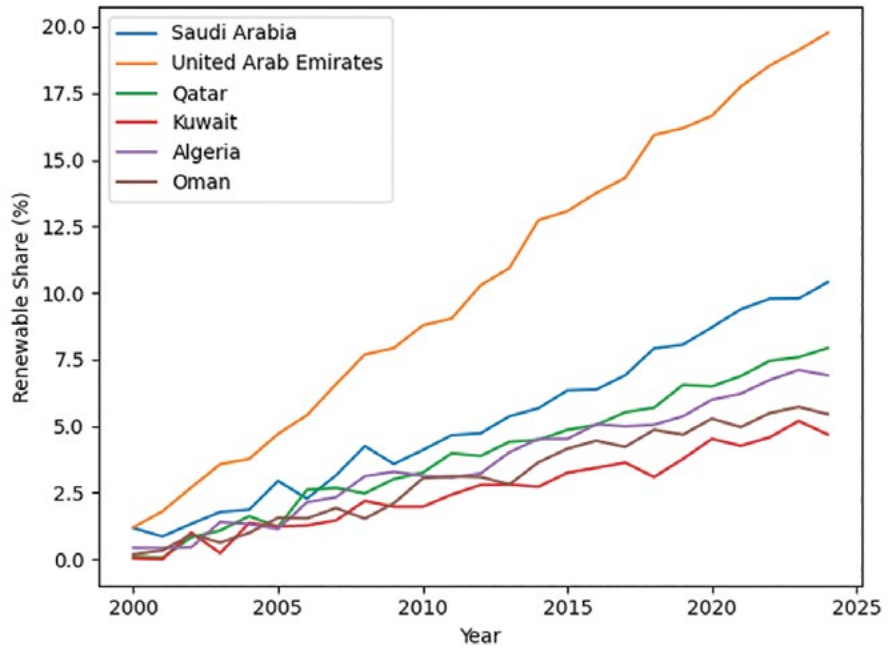
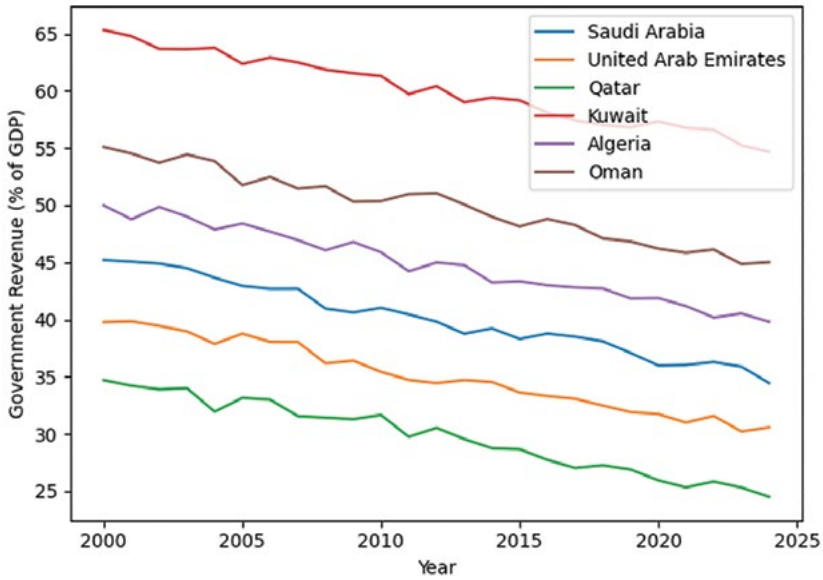


Figure 3. *Government Revenue Ratio Trends (2000–2024). Source: Author's research using R-studio*



Renewableenergy penetration has increased markedly across the six countries, though starting near zero in 2000. The United Arab Emirates leads with penetration exceeding 20 % by 2024, thanks to an ambitious policy and large projects. Saudi Arabia and Qatar follow, reaching roughly 10 % and 8 %, while Algeria and Oman climb toward 7–8 % and Kuwait lags at about 5–6 %. (See Figure 3.)

Across all exporters, government revenue as a share of GDP has declined, signaling reduced dependence on hydrocarbon income. Kuwait remains the highest, dropping from around 65 % to just under 55 %, while Saudi Arabia and the UAE fall from around 45 % and 40 % to roughly 35 % and 30 % respectively. Qatar moves from the low 30s to about 25 %, and Algeria and Oman drift from about 50 % toward the mid-40s. (See Figure 4.)

Figure 4. *Relationship between Renewable Energy and Non-Oil GDP. Source: Author's research using R-studio*

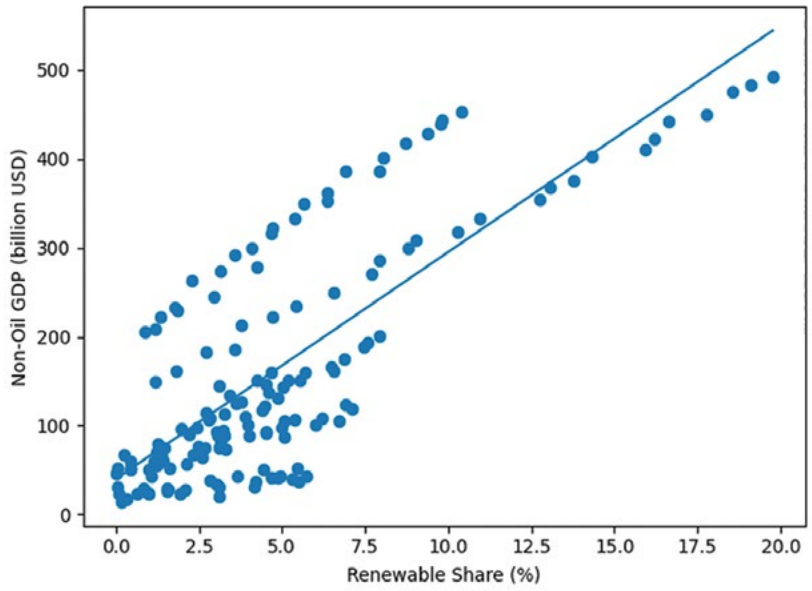
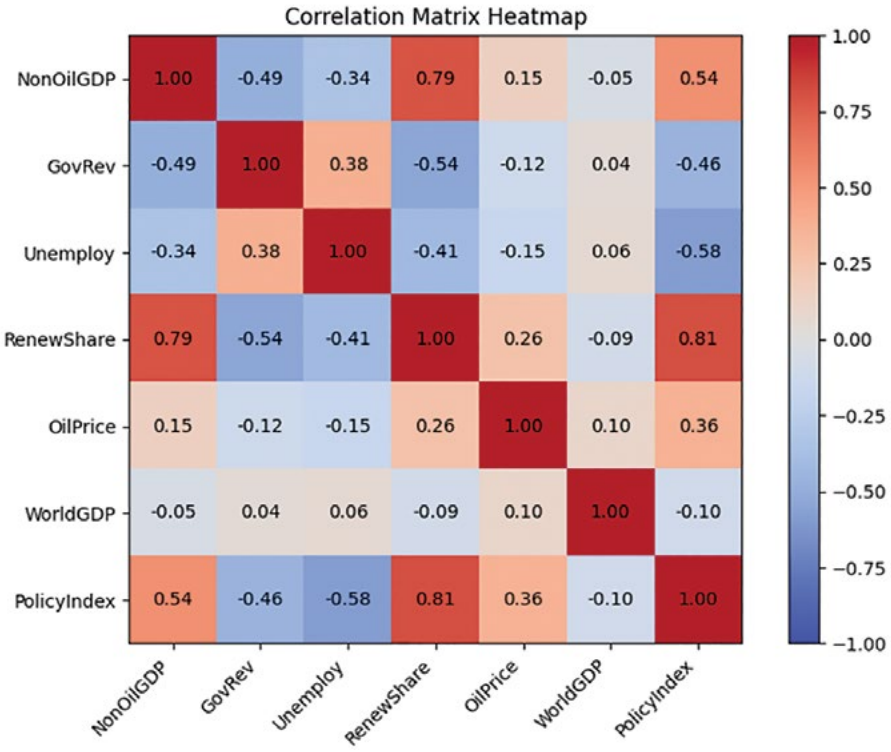


Figure 5. *Correlation Matrix of Key Variables. Source: Author's research using R-studio*



The scatter plot shows a clear positive relationship between renewableenergy penetration and non-oil GDP levels. Countries and years with higher renewable shares tend to exhibit larger non-oil GDP, as evidenced by the upward-sloping fitted line. While there is dispersion in the data indicating that other factors also drive growth, the overall trend supports the idea that cleanenergy adoption complements economic diversification. (See Figure 5.)

The heatmap reveals a strong positive correlation between renewable energy share and non-oil GDP ($\rho \approx 0.79$), suggesting that clean energy adoption supports economic diversification. Similarly, the renewable policy index strongly correlates with both renewable share ($\rho \approx 0.81$) and non-oil GDP ($\rho \approx 0.54$). In contrast, government revenue and unemployment exhibit negative relationships with both diversification and policy indicators. (See Figure 6.)

Figure 6. *Impulse Responses to a Renewable Energy Shock. Source: Author's research using R-studio*

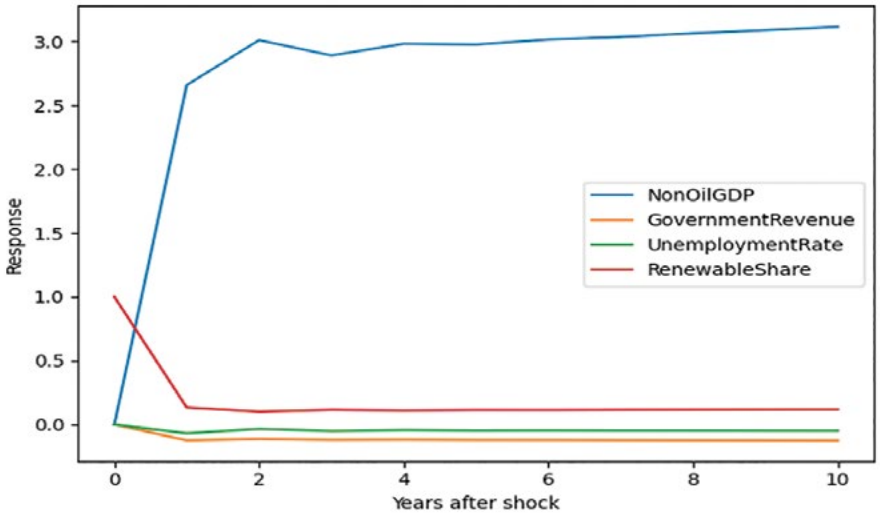
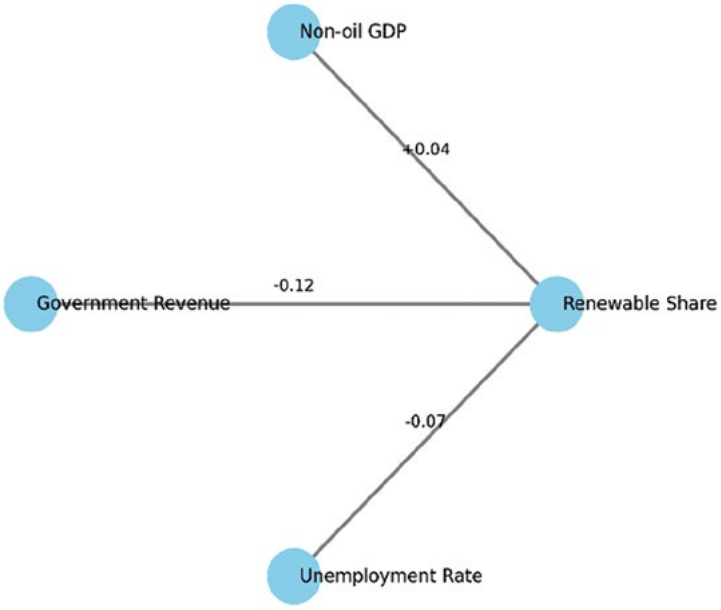


Figure 7. *Network of Lagged Coefficients in the VAR (1) Model. Source: Author's research using R-studio*



This figure plots the response of each variable to a onestandard deviation increase in the renewableenergy share. Non-oil GDP (blue) rises quickly, peaking around year 3 and remaining elevated over the horizon, indicating that renewable adoption stimulates broader economic activity. Government revenue (orange) dips slightly – reflecting reduced reliance on hydrocarbon revenues – then stabilizes near zero, suggesting minimal long-term fiscal drag. Unemployment (green) falls by up to 0.12 percentage points and stays below its baseline, consistent with job creation in cleanenergy sectors. The renewable share (red) itself experiences a large initial jump that decays but remains above zero, reflecting partial persistence of policy or investment shocks. (See Figure 7.)

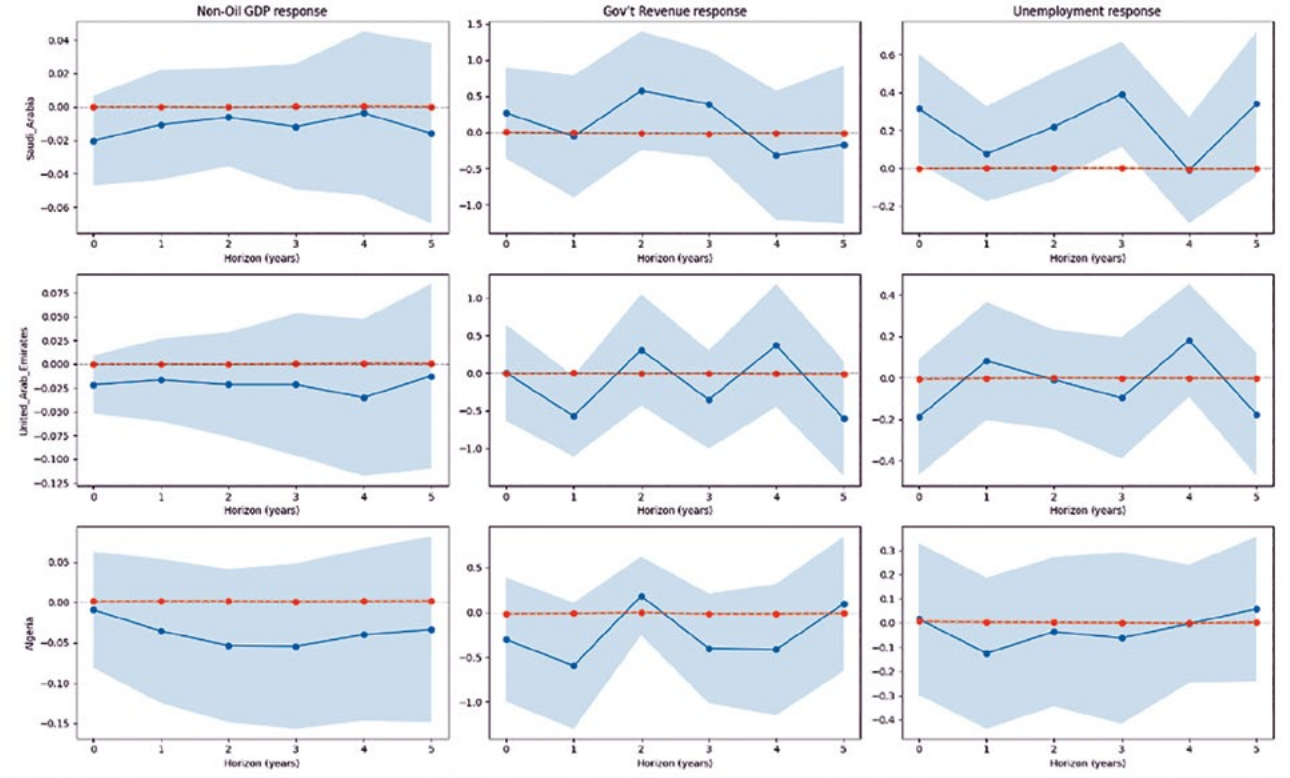
This network diagram visualizes the lagged relationships estimated in the VAR (1) model. Nodes represent the four endogenous variables (Non-Oil GDP, Government Revenue, Unemployment Rate, and Renewable Share). Directed edges show how a lagged change in one variable affects another; edge labels report the coefficient and significance (*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$). The strongest relationships are the autoregressive links (loops omitted for clarity): Non-oil GDP depends heavily on its own past, and Government Revenue strongly on its own past. Notably, lagged Nonoil GDP positively influences the renewable share (0.04***), implying that economic expansion encourages renewable adoption, while lagged Government Revenue has little effect on renewables. Negative edges from renewable share to Government Revenue and to Unemployment Rate (coefficients –0.12 and –0.07) capture the slight fiscal and labormarket improvements following renewable investment. (See Figure 8.)

Figure 8 plots the IRFs for non-oil GDP, government revenue, and unemployment in Saudi Arabia, the UAE, and Algeria following both renewable policy shocks and oil price shocks. We observe that renewable policy shocks generally yield moderate positive effects on growth and employment, while reducing fiscal dependence slightly. In contrast, oil shocks produce weak or insignificant effects, suggesting that domestic renewable efforts may offer more stable macroeconomic benefits.

4.2. Forecast scenario analysis

This section explores forward-looking scenarios for non-oil GDP under baseline and accelerated renewable energy adoption paths across six hydrocarbon-exporting MENA economies. Using structural forecast techniques from the panel SVAR model, we compare economic outcomes in 2035 under two distinct trajectories: continuation

Figure 8. *Country-Level Impulse Responses to Renewable Policy and Oil Shocks. Source: Author's research using R-studio*



of current trends versus an enhanced renewable deployment strategy. These projections not only quantify potential gains from energy transition but also reflect the interplay between policy ambition and macroeconomic responsiveness.

Figure 9 compares the 2035 non-oil GDP under baseline vs accelerated renewables across six hydrocarbon-exporting MENA countries. UAE and Saudi Arabia record the largest absolute gains (exceeding US$150 billion), while Qatar and Kuwait also rise from lower baselines. Algeria and Oman post notable proportional gains, highlighting country-specific potential tied to renewable ambition and capacity. Stronger policy and infrastructure (e.g., UAE) amplify outcomes; weaker frameworks mute them, underscoring renewables as an economic diversification and macrodevelopment opportunity. (See Figure 10.)

Figure 9. *Baseline vs. Accelerated Forecasts. Source: Author's research using R-studio*

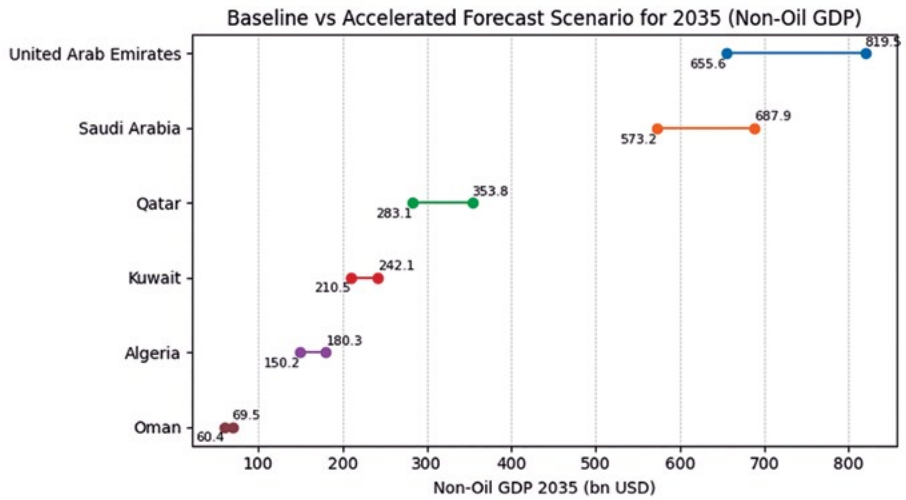
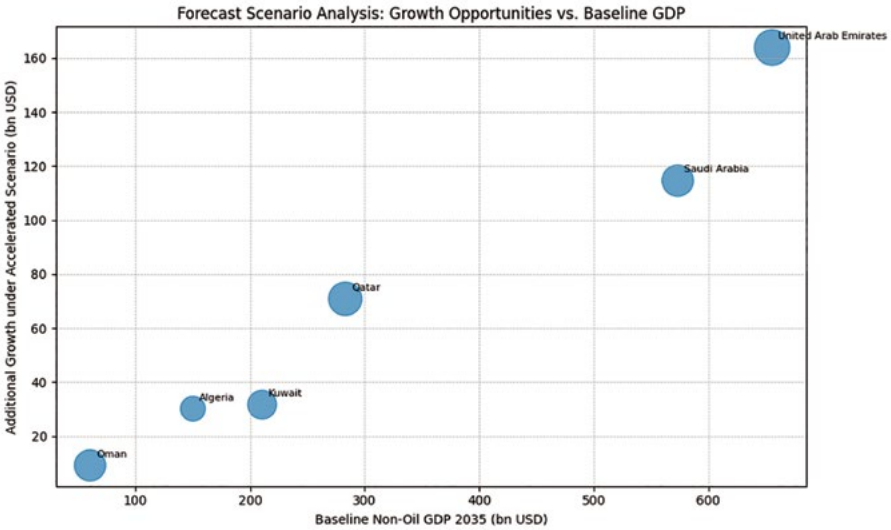


Figure 10. *Growth Opportunities vs. Baseline Size. Source: Author's research using R-studio*

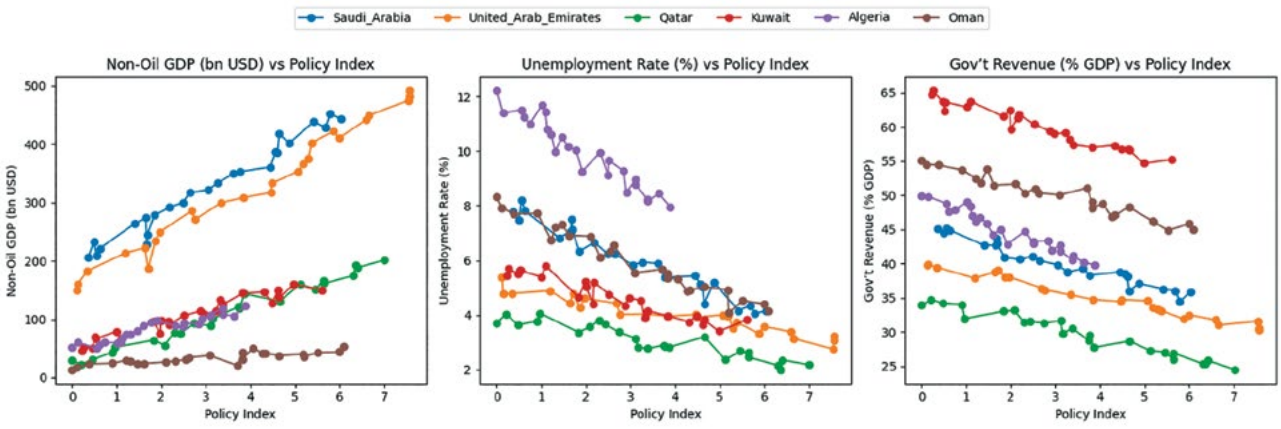


This bubble chart maps each country's baseline non-oil GDP (xaxis) against the additional growth under the accelerated scenario (yaxis); bubble size reflects the strength of each country's renewableenergy policy index. Countries in the upperright quadrant (e.g., United Arab Emirates and Saudi Arabia) combine large economies with substantial extra growth, highlighting their capacity to capitalize on renewable investments. Qatar shows a strong opportunity relative to its size, whereas Kuwait and Algeria have moderate gains with smaller bubbles, signaling less ambitious policy support. Oman sits lower and to the left, indicating both a smaller economy and more modest gains. This chart visually ranks opportunities and underscores how policy ambition interacts with baseline size.

4.3. Sensitivity and model implications

The figure 11 illustrates how macroeconomic variables respond to rising renewable policy ambition across six MENA hydrocarbon exporters. As the Renewable Policy Index increases, non-oil GDP grows across all countries, confirming that proactive renewable strategies align with economic diversification. Unemployment rates decline modestly, reflecting job creation potential in clean energy and associated sectors. Government revenue as a share of GDP decreases slightly, consistent with reduced fiscal reliance on hydrocarbons. Countries like the UAE and Saudi Arabia exhibit the strongest sensitivity due to their ambitious renewable targets and investments. These trends collectively support the hypothesis that renewable adoption enhances resilience and re-

Figure 11. *Sensitivity to Renewable Energy Policy Index in Hydrocarbon-Exporting MENA Countries. Source: Author's research using R-studio*



duces macroeconomic volatility in oil-dependent economies.

CONCLUSION

This study demonstrates that accelerating renewable-energy adoption in hydrocarbon-exporting MENA economies markedly enhances economic diversification: non-oil GDP rises across all countries, unemployment declines, and fiscal reliance on hydrocarbon revenues diminishes. By employing a panel SVAR with exogenous oilprice and globaldemand shocks and a domestic policy index, the research provides novel, causal insights into how renewable shocks propagate through different macroeconomic channels. Scenario-based forecasts indicate that the United Arab Emirates and Saudi Arabia obtain the largest absolute gains from accelerated adoption, while smaller economies like Oman enjoy proportionally significant improvements. The findings underscore the importance of sustained investment in renewables, supportive policy frameworks, and proactive fiscal planning to ensure resilience during the transition. Collectively, the study adds value by filling a gap in exporter-specific analysis and by offering a replicable framework for scenario forecasting in resource-rich economies.

RECOMMENDATIONS

1. Governments should design stable regulatory environments that encourage private investment in renewable projects, including clear bidding procedures, feed-in tariffs, and long-term procurement schedules. Removing fossilfuel subsidies and reinvesting windfall revenues into renewable infrastructure and human capital will accelerate the transition while safeguarding fiscal sustainability.
2. The six exporters can benefit from joint renewable projects, cross-border grid integration, and shared financing mechanisms, such as regional green bonds and climate funds. Developing collaborative platforms for technology transfer and knowledge sharing – especially in storage, grid management, and AI-enabled forecasting – will amplify gains and reduce the costs of transition across the region.

Future work should extend the model to sectoral and microeconomic levels, examining employment effects within specific industries and incorporating household welfare and income distribution. Researchers could also integrate climate risk metrics, financial development indicators, and firm-level data to capture the interactions between renewable adoption, capital markets, and private investment flows.

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