ИНСТИТУТ ЗА ИКОНОМИЧЕСКИ ИЗСЛЕДВАНИЯ НА БЪЛГАРСКАТА АКАДЕМИЯ НА НАУКИТЕ

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DIGITAL TRANSFORMATION AND INNOVATION IN BUSINESS: THE IMPACT OF STRATEGIC ALLIANCES AND THEIR SUCCESS FACTORS[7]

The purpose of the article is to reveal the scientific approach that substantiates the impact of the creation of strategic alliances (SA) on the digital transformation of business and the development of their innovative power based on identified success factors. The aim was achieved using the following methods: abstract logic and typification (for classification of SA's success factors), generalisation (to determine the peculiarities of SA's influence on their innovation development), analytical and ranking method (to determine the relationship between the dynamics creating of SA and the degree of acceleration of digital transformation), expert evaluation (to determine the degree of influence of SA success factors by business areas). Implementing a business-integrated approach to understanding digital transformation will accelerate the implementation of innovation and organisational change, identifies future prospects for market, customer and business relationships, highlighting the importance of researching the factors that ensure their success. An alternative vision of SA's success factors is suggested, which are determined by the possibilities of the organisation of partnerships and organisational culture, integration of business sectors, compatibility of management goals, external relevance, obtaining synergies. Innovation is considered by the authors as an integration factor that reconciles all groups of SA success factors, giving them the necessary focus to solve business problems. The results of the study show that the creation of SA has a significant impact on accelerating and changes the priority of digital transformation of business areas involved in strategic partnerships, and the impact of SA on the development of their innovation power is crucial.
Keywords: digital transformation; innovation; strategic alliances; success factors of SA; business development
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1. Introduction

Nowadays an increase in the intensity of new digital technologies use in the context of increasing business innovation (Bourdeau et al., 2021), a radical transformation of all activities based on business digitalisation (Mezghani, Aloulou, 2019) is seen all over the world. This indicates the need to rethink the conceptual foundations of its development and direction in areas that meet today's demands. Business digital transformation has become the basis for growth and breakthrough innovation, providing modern digital business models (Ziyadin et al., 2020), implementing end-to-end organisational changes and improving business efficiency through operational model transformation (Salyaevich, Pardaev, 2021). It is also relevant for SA creation, which is activated in the growing role of partnerships (Al-Tabbaa et al., 2019) and provides competitive advantages to all parties in the business. The ongoing business' digital transformation forms the basis for reviewing theoretical and applied foundations of SA research, characterised by significant views alternativity. These issues include studying the prospects of organisational changes in SA environment (Albers et al., 2016), change of cooperation forms, efficiency management and SA research methods under the influence of digital transformation (He et al., 2020), studying the impact of key globalisation processes on SA development in the period of economies' digitalisation (Mikhno et al., 2022). However, this area of research is still full of experience paradoxes, needs to fill the theory and practice of SA functioning with new content. Therefore, one of the important areas of SA research today is to determine their impact on business' digital transformation and develop their innovation based on identified success factors.

2. Review of Literature

Research of the peculiarities of SA functioning requires a theoretical generalisation of concepts of digital transformation of business, critical analysis of modern approaches and further systematisation of factors contributing to SA success, revealing the importance of SA creating for their innovation development.

2.1. Scientific approaches in the conceptual vision of the digital transformation of business

Modern scientific thought, where the field of research is a conceptual vision of transitioning processes and technologies to more modern and innovative digital, highlights four main approaches.

The most important for process approach while considering the concept of business' digital transformation is researching IT initiative and knowledge transfer (Li et al., 2022), designing digital business models by combining best practices of business modelling, innovation processes and digital business (Sathananthan et al., 2017), which provides a rapid response to changes in the business environment and a gradual transition to new ways of business activity. A system approach provides a broader understanding of the concept of business' digital transformation, as the systematic use of digital technologies on an innovative basis

provides much greater manufacturability of solutions (Campino et al., 2021), and digital transformation improves organisational readiness of companies (Orji, 2019). Applying a targeted approach emphasises that digital transformation through the use of digital capabilities and technologies provides business models, operational processes and customers by creating new value (Morakanyane et al., 2017). Understanding of strategic importance of a business' digital transformation indicates that the main stages of its implementation should be associated with the impact of digital technologies on the roadmap formation for a business' digital transformation (Strutynska et al., 2019), creating awareness, developing capacity, achieved by implementing digital technologies and digital innovation (Berghaus, Back, 2016). Research worth highlighting, in which the disclosure of the concept of business' digital transformation presents its comprehensive vision from the standpoint of integrating process, system, target and strategic approaches, which is important in terms of getting optimal management decisions (Fenton et al., 2020; Nwaiwu, 2018).

The analysis of modern scientific works highlights concepts of digital transformation of business and is the base for selecting process, system, target and strategic approaches while determining their content, as shown on Figure 1.

Figure 1. Generalisation of scientific scientists' views on implementing digital business transformation

Process approach
The designing process of digital business models that provides a rapid response to changes in the business environment and a gradual transition to new ways of doing business

System approach
Systematic use of digital technologies on an innovative basis, which provides much greater processability of solutions and improves organizational preparation

Scientific approaches to the content of concepts of digital business transformation

Targeted approach
Through the use of digital capabilities and technologies provides business models, operational processes and customers by creating new value

Strategic approach
Strategic consumer-driven business transformation that requires end-to-end organizational change and introduction of digital technologies

Source: compiled by the authors.

The importance of integrating basic principles of management theories, international business and innovation development indicates that in defining the essence of digital transformation concepts, it is more appropriate to use a business-integrated approach. Thus, digital transformation of business is proposed to define as the vector of business development, which involves the introduction of advanced digital technologies in the management system that requires end-to-end organisational changes, and along with

improving business interaction with customers, partners, staff, government and society it provides new products, qualities and values creation in a clearly defined strategic perspective.

Following the business integrated approach, the basic directions of digital transformations of SA business into creating value chains include the sphere of interaction with clients, business processes and development of business models, which implementation results in unified data and processes, improvement of analytical and digital opportunities, business integration and IT, automating the decision-making process. Given the accelerated implementation of innovative changes, it will ensure formatting a new market, customer and business.

2.2. Systematisation of strategic alliances' success factors

At the current stage of improving the interaction between business partners, SAs play an important role in the exchange of resources and technologies, risk sharing in order to adjust and coordinate activity of creating new business value (Fatehi, Choi, 2019). Indicated goal acquires a higher level if, during SA formation, the focus on creating new value and existing opportunities of partner companies are mutually agreed (O'Dwyer, Gilmore, 2018). It has a positive impact on the results of partners' activity in terms of financial, operational and organisational efficiency (Britchenko et al., 2018; Kryvovyazyuk et al., 2019), as well as on the companies' market performance with a moderate number of SA participants (Moghaddam et al., 2016). However, SA success may also depend on the promotion of innovation implementation at different levels of management and the strategic compatibility of partner companies' goals.

The exchange of knowledge between partners is extremely important in SA environment, providing access to the knowledge of another business partner, the joint development of new knowledge, their application in management, as well as to support effective work. SA's success factors include the ability to combine skills, knowledge, technology and other resources, strategic matching, trust between partners, informal communication, determinants of obtaining knowledge that promotes innovation, organisational innovation, partner relationships during the agreement, strategic compliance between partners (Drewniak, Karaszewski, 2020), external compatibility of partner companies competencies, communication, integrative competencies, cultural compliance of business partners (Čirjevskis, 2021), compatibility of partners strategic goals and their strategic capabilities (Kryvovyazyuk, Strilchuk, 2013).

SA success factors are systematised according to the criteria presented on Table 1.

Given classification demonstrates the importance of innovation as a mutually reconciling factor that contributes to SA success.

Table 1. SA success factors and the benefits they can provide

Criteria for classifying success factors	SA's success factors	Obtained benefits
The level of organising partnerships and organisational culture	o organisational innovations; o additional skills and partners' knowledge; o high level of trust; o openness and interactivity of communication; o minimal overlap of partner markets; o respect for differences in corporate culture.	Introduction of new methods of organising procedures and methods of work.
Business sectors' integration level	o compatibility of high-tech industries and partners sectors by business; o compliance with the levels of digital business transformation; o interchangeability of methods and forms of work in the market; o compliance of applied technologies of digital transformation; o speed of business diversification in relation to the spread of innovations; o degree of staff mobility.	Increasing business mobility based on digital transformation.
Level of compatibility of management goals and strategic capabilities	o compatibility of partners' strategic goals; o attainability of strategic goals of mutual benefit; o compliance of partners' contribution to the business scale; o compliance of partners' contribution to the implemented innovations; o coordinating or adjusting the speed of the agreement objectives; o negotiating or adjusting the speed of agreement parameters.	Accelerate decision-making and increase their efficiency through managerial innovations.
Possibilities of achieving a synergistic effect	o inspiring innovations; o complementary assets and technologies exchange; o knowledge acquisition factors that contribute to the introduction of innovations; o external compliance of the competencies of partner companies; o partners' abilities and adaptation during implementation; o strengthening operational integration as SA develops.	Promoting achieving synergies through inspiring innovation.
Level of external relevance	o integration into globalisation processes; o strengthening positions in international markets; o demonstration of competitive advantages in the struggle for new segments of international markets; o responding to the effects of political and legal restrictions; o creating conditions for creating alliances.	Adaptation to changing circumstances of the market environment through market innovations.

Source: compiled by the authors.

2.3. Strategic alliances and their innovation development

Cooperation within the SA provides greater opportunities for developing and implementing innovation processes using new methods and forms of work, new solutions in the high-tech sector, and innovations in management. Such cooperation gets special development in conditions of training the alliance with modern methods, ensuring its appropriate volume and intensity (Hübel et al., 2022). Scientists have found SA's positive direct impact on innovations and new product development, mediating the role of exploration and exploitation as dynamic capabilities. It is recommended to improve the exchange of knowledge between

business partner companies to increase innovative results (Ferreira et al., 2021). It is necessary to create an appropriate incentive mechanism in order to increase the ability to acquire and transfer knowledge between partner companies for further development of SA's innovation system (Zhao et al., 2019). SA creation leads to better innovation results if the partners have a common institutional owner or have a higher degree of technological proximity (Chemmanur et al., 2016). It is important to apply managerial innovations needed to improve the quality of decision-making, create long-term competitive advantages (Kryvovyazyuk et al., 2020). Another study demonstrates SA's impact on innovation outcomes through the accumulation of internal R&D through increased absorption capacity (Paula, Silva, 2018). In order to avoid negative consequences of SA creation on the development of innovation, it is necessary to avoid overspending on innovation activities and consider national specifics of partners' development and regional peculiarities of SA formation.

Investigating SA impact on the development of their innovation, it is important to form an understanding of the need to create them to address the strategic objectives and goals of partner companies. Growing geopolitical threats, demographic changes, increasing competition in international markets, as well as the need for organisational changes under the influence of digital transformation of business cause a more serious attitude to partnerships between companies of different types, scales and achievements.

Summarising the views of scientists reveals that in the conditions of digital transformation of business, SA success depends on many factors, where innovation is a special factor that reconciles all groups of factors of SA success, giving them the necessary focus to solve business tasks.

3. Methodology and Data

Within the research, the scientific approach is suggested, which in combination with applied scientific and special methods, ensures achievement of the research goal – justification of the impact of SA creation on the digital transformation of business and development of their innovative power based on defined success factors. It will allow forming an appropriate platform to confirm the feasibility of activating the further SA creation based on the obtained evidence.

The practical implementation of this idea requires the development of an appropriate analytical basis: summarising analytical conclusions based on the study results of the dynamics of SA creation and changes in the priority of business' digital transformation, determining how SA forming provides growth of innovation power based on the study of the influence of factors creating their success. Research period: 2014-2021.

In the modern environment of IT and fierce competition in an innovative market economy, the smallest information advantage over competitors is able to play a critical role in effective enterprise management (Vakhovych et al., 2021). This advantage for business is provided by the relevance of collected data and scientific methods that add validity to conclusions justification.

The article uses the development of descriptive research using a system of scientific methods. The use of research design and data collected ensured the reliability of obtained results. Information databases were obtained using a targeted sampling method based on the compilation and processing of statistical information from the International Institute for Management Development (Bradley et al., 2015; Wade, 2017; Yokoi et al., 2019; Wade et al., 2021), BSG (Özbek, 2022) and World Bank (2022). Such research methods were used to solve set tasks: analytical and ranking methods (to determine the relationship between the dynamics of partnership agreements concluded by joint ventures and SA with the degree of acceleration of digital transformation and change its priority by business areas; study the dynamics of SA innovative power); the method of reference scoring (to determine the degree of SA success factors influence by business areas).

The analytical method helped to identify dynamic changes in the conclusion of strategic partnership agreements to make an analytical comparison with the degree of acceleration of digital transformations (by areas of its priority). The priority areas indicate the branches of business that differ in the degree of acceleration of digital transformation. The rank of the business sphere from 1 to 14 indicates the degree of acceleration of digital transformations: from 1 – the highest to 14 – the lowest degrees. The priority ranking of digital transformation by business spheres was determined based on the results of quantitative analysis of market data of business representatives of the most developed countries of the world. It is recommended to choose as evaluation criteria the level of venture capital investment for conducting digital business transformation, the speed of digital transformation of business, the efficiency of using the resource base to overcome barriers on the way to digital transformation, and the level of existential threat to the industry in case of non-compliance with the pace of digital transformation. In order to ensure justification of results, the value of the final indicator for each of the evaluation criteria is formed on the basis of the calculation of the relevant indicator systems and is subject to standardisation. For each branch of business, the integral indicator is calculated as the sum of the products of standardised indicators with the corresponding weighting coefficient within the selected evaluation criteria and their level of influence, and the resulting score is used for further ranking. The priority classification of business areas according to the degree of digital transformation is carried out by the Sturges rule method, which allows ensuring the reliability of the research results. Therefore, the analysed areas of business are divided into three assessment groups: high priority (which indicates changes in profitability and growth opportunities of the business sector), medium priority (characterises the efficiency and stabilisation of development, studying opportunities for concentration in the business sector) and low priority (determines opportunities for cost optimisation and business consolidation in the industry). An analytical method was also used to study the dynamics of SA's innovation power.

The method of reference point evaluation was used to determine the degree of SA success factors influence by business areas. Each of the success factors that meet the defined criteria of their classification and takes place in the SA management (according to Table 1) is awarded 2 points for constant influence, 1 point for partial influence, 0 points for no influence of the selected factor. The interpretation of SA success rate impact is as follows: 10-12 points – high level, 8-9 points – sufficient level, 6-7 points – medium level, 5 points and below – low level (for each criterion).

4.   Results and Discussion

4.1. Creating SAs and prioritising digital transformation of business

Up to 76,000 joint venture agreements and 127,000 SA agreements have been concluded worldwide since 1985, bringing the total number of strategic partnerships to about 204,000 (Refinitiv, 2022). According to the research results, more than 40,000 different types of agreements were concluded in 2014-2021; their dynamics are shown in Figure 2.

Figure 2. Dynamics of concluded agreements within the framework of strategic partnership in 2014-2021
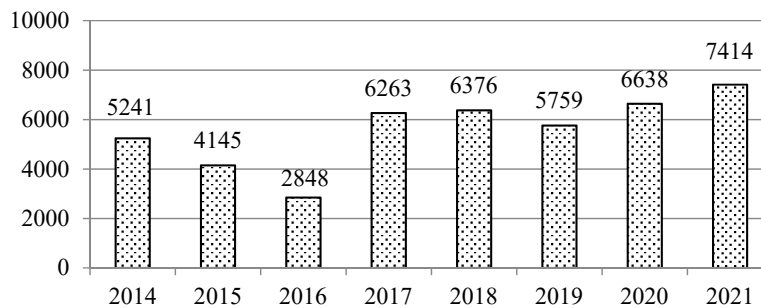
Source: compiled by the authors in accordance with World Bank, 2022; Refinitiv, 2022.

It is established that in 2017-2021 the number of concluded agreements in the field of strategic partnership compared to the crisis of 2016 increased by 2-2.6 times. The dynamic growth of concluded agreements number on SA creation has accelerated the digital transformation of business industries involved and expanded the scope of strategic business partnership, changing their structure and priority of digital transformation, as defined in Table 2.

In 2014-2021 the largest acceleration of the digital transformation was made by Healthcare & Pharmaceuticals (+4), Telecommunications (+2), Retail (+1), Media & Entertainment (+1), and the largest slowdown – Manufacturing (-5), Energy & Utilities (-4), Hospitality & Tourism (-3), Technology Products & Services (-3), Financial Services (-1). For other areas of business, digital transformation has had a neutral impact – Education (0). The business areas, that have appeared in the ranking since 2017, are characterised by the following changes: Professional Services (+1), Real Estate (0), Transportation & Logistics (0) and Consumer Packaged Goods (-3).

Table 2. Priority of digital transformation by business areas

Business areas distribution	2014-2015	2016-2017	2018-2019	2020-2021
High-priority digital transformation	1.Technology Products & Services 2.Media & Entertainment 3.Retail 4.Financial Services 5.Telecommunication	1.Media & Entertainment 2.Technology Products & Services. 3.Retail. 4.Financial Services. 5.Telecommunication	1.Media & Entertainment 2.Technology Products & Services 3.Telecommunications 4.Retail 5.Financial Services	1.Media & Entertainment 2.Retail 3.Telecommunications 4.Technology Products & Services 5.Financial Services
Medium-priority digital transformation	6.Education 7.Hospitality & Travel 8.CPG & Manufacturing 9.Healthcare	6.Consumer Packaged Goods 7.Education 8.Professional Services 9.Hospitality & Tourism	6.Hospitality & Tourism 7.Transportation & Logistics 8.Education 9.Professional Services	6.Education 7.Professional Services 8.Healthcare & Pharmaceuticals 9.Consumer Packaged Goods
Low-priority digital transformation	10. Utilities 11. Oil & Gas 12. Pharmaceuticals	10. Manufacturing 11. Transportation & Logistics 12. Real Estate 13. Healthcare & Pharmaceuticals 14. Energy & Utilities	10. Consumer Packaged Goods 11. Healthcare & Pharmaceuticals 12. Manufacturing 13. Energy & Utilities 14. Real Estate & Construction	10. Hospitality & Tourism 11. Transportation & Logistics 12. Real Estate & Construction 13. Manufacturing 14. Energy & Utilities

Source: compiled by the authors in accordance with Bradley et al., 2015; Wade, 2017; Yokoi et al., 2019; Wade et al., 2021.

The Media & Entertainment sector is assigned the highest priority for the digital transformation of business due to its greatest vulnerability to digital disruption. Intense threats of disruption have led to increased innovation in the sector. For example, some film studios have experimented with the online release of films. While movie studios struggled to distribute their content through traditional channels, streaming services derived revenue from subscribers (Wade et al., 2021). The Retail sector is assigned a high level of digital transformation mainly due to the growth of e-commerce, the share of which in the global volume increased from 7.4% to 19.5% in the researched period (Coppola, 2022). Amazon, Alibaba, and Zalando had a significant impact on the development of e-commerce. Digital shifts in the Telecommunications sector have been implemented by improving the interaction with customers based on digital solutions, automation of work processes, use of big data and artificial intelligence. In particular, process improvement and innovation have been achieved by AT&T based on artificial intelligence and machine learning programs by Deutsche Telekom through the use of search engines and Globe Telecom based on cloud technologies (Javaid, 2022). The Technology Products & Services sector significantly supported the development of financial services, retail, media, education and transportation during the pandemic. The Financial Services sector also belongs to the centres of digital transformation of business, but in recent years it has lost its position to a small extent due to the reduction in consumer demand for goods. However, electronic platforms are developing, among which Fintech is actually a high-priority digital transformation (focus on profitability and growth), including Revolut and Robin Hood. The Healthcare & Pharmaceuticals sector, which

underwent the greatest digital transformation in 2019-2021, due to the spread of the COVID-19 pandemic, achieved this thanks to the increase in strategic alliances, the growth of venture capital investment in the area of biotech and pharma. It is worth emphasising that more than 20% of digital healthcare start-ups in Europe emerged during the first waves of the pandemic (Wade et al., 2021). The Hospitality & Tourism sector has experienced a slowdown in the digitalisation of business due to a reduction in the provision of tourism services, a reduction in venture capital funding as a result of the COVID-19 pandemic. The Education sector has seen improvements in digitisation due to the shift to distance education as a result of the spread of COVID-19, but the shifts in the public sector have been much slower compared to the commercial education sector and due to increased venture capital funding.

However, the inclusion of Transportation & Logistics in the sphere of low-priority of digital transformation remains a debatable issue, which is partly due to the significant digitalisation of this business area in 2019. After all, this sector is characterised by both positive and negative changes. Among the positive ones, such as the ongoing electrification of transport and autonomous vehicles, an increase in cargo transportation by air transport should be highlighted, while among the negative ones – a reduction in passenger transportation services by air transport. The same goes for Real Estate & Construction, where the growth of digital transformation can make business much easier. The digital transformation of Manufacturing remains incomplete due to the lack of a high economic effect impact on companies and its active implementation in the period preceding 2015.

Among the factors influencing identified trends in the digital transformation of business are the spread of the COVID-19 pandemic, resulting in a growing need for information exchange and consumer goods, crises in the development and energy supply of industrial production, and reduction of tourist and financial services. The pandemic has accelerated digital business transformation, in particular, in April 2020, 68% of respondents, and in January 2021, 83% of respondents noted that. A survey of companies' senior management teams found that prior to COVID-19, only 68% of them considered the digital transformation of the business as a top priority for promoting development, compared to more than 90% of them during the COVID-19 pandemic. There is also a clear link between the propensity for the digital transformation of business and company size. Thus, for small firms, 55% of respondents are inclined to use digital strategies and transformations, for medium – 62%, for large – 78%, then for very large ones, which include SA, this tendency has 90% of respondents. The focus on investing in digital instruments is more on supporting innovation and growth (Wade et al., 2021).

The obtained research results can be useful in determining further digital transformations in a certain sector of business from the point of view of the trends that characterise changes in the priority of its digitalisation. Their relevance for business increases when choosing a digital strategy when looking for reasons that make it difficult to determine the goals of digital transformations when establishing factors that influenced the acceleration or deceleration of digital transformation of business spheres. This will show the effectiveness or, conversely, the fragmentation of SA's digitisation policy, depending on the research findings.

4.2. The growth of SA innovative power

Acceleration of end-to-end organisational changes and introduction of innovations in SA's activity is carried out for the purpose of formation of a new market, clients and business. This, in turn, requires improving the organisation of partnerships and organisational culture, ensuring the integration of business sectors, achieving compatibility of strategic management goals, finding additional opportunities to achieve synergy effect, and increasing the level of external relevance of companies.

SA's number in the world is growing rapidly and their innovation power is increasingly becoming a determining motivating factor due to the rapid implementation of technological changes, achieving competitive advantage, improving the satisfaction of the need for innovation, creating opportunities to enter new markets, increasing the scale of activity (Özbek, 2022). This is evidenced by the research data summarised in Figure 3.

Figure 3. Number of SA formed to address these innovation topics in 2016-2021

share of SA pursuing innovation goals in their total number
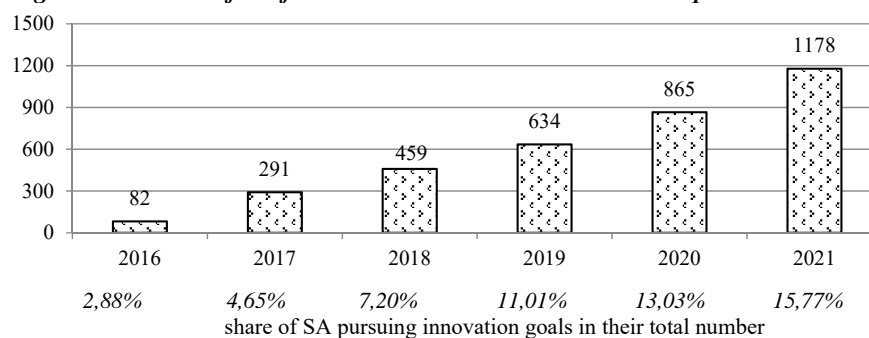
Source: compiled by the authors in accordance with Özbek (2022) and own research.

Research has shown that SA's innovation is closely linked to the digital transformation of business processes based on information and communication technologies like big data analysis, artificial intelligence, blockchain, purchasing know-how, mobility, etc. That is, SA not only contributes to the digital transformation of various areas of business, but also through the use of digital technologies to increase their innovative power.

The significant influence of SA on the development of innovations is indicated by the following facts. Thus, the development and implementation of vaccines against COVID-19 have become possible thanks to the creation of associations of pharmaceutical giants with the capabilities and infrastructure necessary to successfully pass the drug through clinical trials, followed by its introduction into mass production and distribution. And therefore, Pfizer-BioNtech, Moderna, and AstraZeneca-Oxford vaccine-producing partnerships have performed with impressive efficiency. Daimler is leveraging the best in the automotive industry opportunities to address the challenges of future mobility through a portfolio of alliances and joint ventures. In the electric mobility sphere, Daimler has formed an SA with China's BAIC Group and American electric bus manufacturer Proterra. The company also collaborates with BMW, Bosch and Torc Robotics to develop autonomous driving systems

and with ChargePoint for innovative electric infrastructure solutions. Aluminium producer Alcoa and mining company Rio Tinto have formed SA to develop an innovative, low-emission aluminium production process. The purpose of SA Renault, Nissan and Mitsubishi was to acquire new opportunities and innovations in procurement, development and production, the target direction of which is to enter new markets and expand the scale of production. Among Google's many innovation-driven SAs is its relationship with luxury eyewear maker Luxottica, which the company relies on to develop wearables. The alliances between Tesla and Panasonic for the development and production of lithium-ion batteries for electric vehicles and between Uber and Spotify for mobile solutions, illustrate how members can use the different roles of their partners in the value chain for innovation (Özbek et al., 2022).

Research of SA success factors in 2014-2021 in various business areas (Sony and Panasonic; Daimler, BAIC Group, Proterra; Pfizer and BioNtech; Renault, Nissan and Mitsubishi; Elysis; Hewlett-Packard and Microsoft; Moderna and AstraZeneca-Oxford and others) using the method of reference scoring revealed results summarised in Table 3.

Table 3. The level of influence of SA success factors by business areas

Researched areas of business	Organisation of partnerships, organisational culture	Integration of business sectors	Compatibility of management goals and strategic capabilities	External relevance	Achieving a synergistic effect
Media & Entertainment	high	high	high	high	high
Retail	high	high	high	high	high
Telecommunications	high	high	high	high	high
Technology Products & Services	high	high	high	high	sufficient
Financial Services	high	high	high	high	sufficient
Education	sufficient	high	high	high	sufficient
Professional Services	sufficient	high	high	high	sufficient
Healthcare & Pharmaceuticals	sufficient	high	high	high	sufficient
Consumer Packaged Goods	sufficient	high	sufficient	sufficient	sufficient
Hospitality & Tourism	sufficient	sufficient	sufficient	intermediate	intermediate
Transportation & Logistics	sufficient	sufficient	sufficient	intermediate	intermediate
Real Estate & Construction	intermediate	intermediate	sufficient	intermediate	low
Manufacturing	intermediate	intermediate	intermediate	intermediate	low
Energy & Utilities	intermediate	intermediate	intermediate	intermediate	low

Source: compiled by the authors.

Ensuring a high level of priority for digital transformation and innovation through SA creation in Media & Entertainment, Retail, Telecommunications, Technology Products & Services, Financial Services is supported by a high level of partnership and organisational culture, integration of business sectors, compatibility of management goals, external relevance and synergy effect (for Technology Products & Services and Financial Services is

characterised by a sufficient level). For SA Education, Professional Services, Healthcare & Pharmaceuticals and Consumer Packaged Goods, the average level of digital transformations priority is provided by a high level of integration of business sectors, compatibility of management goals, and external relevance. The low level of acceleration of digital transformations and innovative power in such sectors of SA creation as Hospitality & Tourism, Transportation & Logistics – is caused by the decrease in external relevance and opportunities to achieve synergetic effect from sufficient to average, compared to other researched business areas; for Real estate & Construction, Manufacturing and Energy & Utilities – is caused by the average level of organisation of partnerships and organisational culture, integration of business sectors, compatibility of management goals, external relevance, low level of opportunities to achieve synergy effect.

Making an attempt to determine the degree of influence of SA success factors by business spheres is useful from the point of view of studying the feasibility of further improving the level of partnership and organisational culture, integration of business sectors, compatibility of management goals, external relevance and synergy effect. After all, this will affect the effectiveness of SA creation in the future, which has undeniable relevance for business. At the same time, obtained results are new, because previously conducted research was limited to studying the issues of the exchange of resources and technologies, risk sharing in order to adjust and coordinate activity of creating new business value, as well as establishing the influence of individual factors of SA success without their proper grouping. Therefore, it will have a certain significance for the development of scientific approaches to justifying the impact of the creation of SA on the digital transformation of business.

5. Conclusion

Research describes a scientific approach that justifies the impact of SA creation on the digital transformation of business and the development of their innovation based on 5 groups of success factors. Theoretical and empirical authors' contribution to research is to form a business-integrated approach to understanding digital transformation as a vector of business development, which involves the introduction of advanced digital technologies in the management system, accelerates innovation and organisational changes, and determines the importance of researching factors ensuring their success. Research results proved that SA creation is closely related to processes of accelerating the digital transformation of business areas involved in strategic partnerships, promoting its development, and through the use of digital technologies increases their innovation power. SA's success factors grouping and further assessment of their impact on digital transformation and innovation power allowed establishing the level of organisation of partnership and organisational culture, ensuring the integration of business sectors, achieving compatibility of management goals, ability to achieve synergy effect and increasing external relevance have different degree of influence on the studied processes in the analysed business areas. The research revealed a trend towards an increase in the number of strategic partnership agreements and a change in the priority of digital transformation of partner companies in various areas of business. It is important to confirm the fact that the innovative power of SA creating is growing. It was found that the

share of SA pursuing innovation goals in their total number in the analysed period increased from 2.88% to 15.77%. Therefore, in order to improve processes of business' digital transformation and increase innovation power, companies need to look for promising partners and create SA.

Further research should be directed at establishing the relationship between the dynamics of indicators of SA creation and the degree of acceleration of their digital transformation, and also focus on the development of digital strategies, taking into account the innovative power of SA.

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Anton Gerunov[1]

STOCK RETURNS UNDER DIFFERENT MARKET REGIMES: AN APPLICATION OF MARKOV SWITCHING MODELS TO 24 EUROPEAN INDICES[2]

This paper studies the different modes of operation of European stock markets. Using data on 24 European indices over a period of 15 years, we show that these can be well represented by a Hidden Markov Model with two regimes that roughly correspond to bull and bear markets. We further estimate regime parameters and show that the alternate regimes have very different risk-return tradeoffs with clear implications for portfolio management. Corresponding transition probability matrices show the remarkable persistence of states and give a possible quantitative estimate of the degree of inertia in financial markets. Regime-switching coordination across markets is further examined, showing that moments of correlations are followed by idiosyncratic episodes and thus, risk diversification through regime arbitrage is possible.
Keywords: market returns; Markov switching model; regime change; European stocks
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1. Introduction

Estimating key financial market parameters is crucial in both theoretical and practical terms. On the academic front knowing the average returns, risks, and the risk premium allows the researcher to estimate risk aversion, the cost of capital and to model wider macroeconomic dynamics. For the practitioner, those are important when making an investment, savings, and retirement decisions. The usual approaches to reach those estimates focus on detailed time series of either realized returns or calculated discounted cash flows, with a spruce of more exotic approaches in-between. While all those methods have their benefits, it is very often that they assume a certain consistency of the estimated parameters. However, it is well established that financial markets fail to remain time-invariant and are subjects to episodes of expansions and contractions, disparate modes of volatility, and episodes of irrational (or rational) exuberance. In short, there are different regimes under which stock markets tend to operate (Baltas, Karyampas, 2018).

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This article aims to investigate further whether this is the case for European stock markets by applying a data-driven approach to estimating different market regimes. To this end, we leverage a Hidden Markov Switching model that enables the calculation of different regimes, the density functions of their respective key parameters, and the switching probability throughout each. This is then used to estimate the long-run returns, risks, and equity risk premia in 24 European stock markets over a 15-year period ranging from 2006 through 2020. The results outline the significant difference between the financial markets with crucial implications for equity investors. Moreover, we show that highly developed financial markets tend to cluster together, while less developed ones display more or less idiosyncratic dynamics. This finding leads to distinct implications for practitioners and opens new venues of research.

The article is structured as follows. The second section begins by outlining how the return, risk, and equity risk premium (ERP) are correlated. The most common approaches to calculating the ERP are outlined, together with more recent results. The third section introduces the methodology and the model estimation approach for calculating different regimes by briefly outlining the Markov Switching Model and its relevance for financial research. The fourth section proceeds to make an overview of the 24 European financial markets under study by summarizing a few key stylized facts about them. The following section calculates Markov switching models for each of the markets and presents the numeric estimates for the realized returns, levels of risk, and equity risk premia. Then we elaborate on the results by outlining a few recommendations. The final section is a concluding one.

2. Essence and Application of Hidden Markov Models to Financial Markets

While it is widely acknowledged that stock market characteristics such as risk and return vary over time, with a clear tendency for similar observations to cluster together. However, the precise mechanics of regime switching are yet to be fully resolved. The fact that stock markets operate under different regimes is hardly novel – at a minimum their dynamics differ significantly in times of growth and in times of recession. Classical ideas, such as the Efficient Market Hypothesis (EMH), would imply random price movement spurred by new information. It remains unclear whether this information signals a switch to a new state of operation (regime) of the market or is just regular innovation within the current regime. This clearly puts forward the need to leverage a data-driven approach to decide what regime is currently the stock market operating in and what are the crucial characteristics of this specific state of nature.

To this end, the researcher may use a Hidden Markov Model, HMM (Nguyen, Nguyen, 2015). The idea behind such a model is that we have an objective state (e.g. jobless recovery, irrational growth, fear of recession) which is not directly visible in the data, but it leads to the generation of observable data points such as asset returns or levels of volatility. The Hidden Markov Model uses observable data to estimate the current regime and a matrix of transition probabilities for regime switching. In a similar vein, Nguyen (2017) proposes using an HMM for the prediction of technology stocks and finds that is effects significantly both stocks trading and derivatives hedging. While the HMM approach is well-recognized among other

more familiar ones (Somani et al., 2014; Sutkatti, Torse, 2019), it still remains a relatively new addition to the financial toolbox as compared to more traditional analytic methods.

As early as 1998, Ryden et al. (1998) leveraged an HMM approach to model daily returns from 10 subseries of the S&P500 index. They use a combination of information criteria and reach the conclusion that HMMs estimated on their data tend to be characterized by either two or three regimes. Moving beyond those numbers was considered computationally prohibitive at the time. Those estimated HMMs are found to be a very good fit for S&P500 dynamics. In 2005 Hassan & Nath (2005) already noted that the HMM might be a new paradigm for analyzing financial markets. They model the price of interrelated airline stock using a Hidden Markov Model and utilize it for price forecasting. The main result is that this approach presents a viable forecasting mechanism.

Much research followed with Hidden Markov Models being applied to a wide variety of pertinent theoretical, as well as practical issues. Hassan (2009) further expands on HMM modelling by proposing to combine the HMM with a fuzzy model for stock market forecasting and apply it to data on six stocks (three airlines and three IT companies). The combined model is shown to outperform competing ones such as an Autoregressive Moving Average (ARIMA), Artificial Neural Network (ANN), and another HMM. Similarly, Gupta and Dhingra (2012) study 4 stocks and found that an ensemble HMM outperforms both ARIMA and ANN. As an input parameter to the HMM they assume that the number of states is four, but this lacks formal justification. Zhang et al. further enhance the model by proposing their Extended Coupled Hidden Markov Model that is able to take into account news events as well as historical trading data and stock correlations. Testing it on Chinese A-share market data in 2016 shows that it outperforms a number of state-of-the-art alternatives.

Nguyen and Nguyen (2015) use approach the portfolio selection problem with a sophisticated HMM-based approach. They make monthly regime predictions for the consumer price index, industrial production, S&P500, and market volatility. In parallel, they analyze all the stocks in the S&P500 index and assign them scores depending on how much they benefit from different regimes. Using this algorithm, they compose a portfolio of stocks which turns to significantly outperform the benchmark S&P500 – by generating a return of 14.9% to 2.3% for the index.

Baltas and Karyampas (2018), find strong effects on the specific regime of operation of the stock market on the valuation of the equity risk premium. They further argue that taking into account the regime dependence of returns allows one to better forecast the equity risk premium, thus improving the portfolio allocation decisions. In a 2018 paper, Nguyen (2018) applies a Hidden Markov Model to data on the closing prices of the US index S&P 500. Using a set of four information criteria, he finds out that an HMM with four regimes best captures the data at hand. This model is able to outperform traditional stock price prediction methods, thus underlining the viability of using a Hidden Markov Model for modelling and forecasting the stock market. In a similar vein, Kole (2019) uses S&P500 data to demonstrate the application and utility of an HMM model. Here, a 2-state HMM is assumed with little recourse to the need of precisely choosing the number of regimes of the market. In general, academics and practitioners tend to prefer fewer number of regimes, making for a more tractable model. Thus, a usual choice is to assume just two states (bearish/bullish market). It

is the rare exception that a large number of regimes are assumed as in Sasikumar & Abdullah (2016).

Kim et al. (2019) use a Hidden Markov Model to identify the regime for global assets divided into 10 classes, or 22 subclasses, leveraging data from the beginning of 2004 to the end of 2018. The number of regimes is assumed to be three, with little recourse as to why this precise number is taken. They show that using the HMM improves portfolio results in a number of dimensions and propose that HMM may enable more stable portfolio management compared to momentum strategies. Acula and Guzman (2020) use an enhanced HMM model to predict the closing prices of Nokia and Apple stocks. In the former case, their proposed model outperforms a neural network, while in the latter one, they tend to be on par.

Dias et al. (2015) are among the few research papers that focus on European stock market dynamics over the period 1998-2013. They analyze data on 21 European stock market indices leveraging an extended Mixture Gaussian Hidden Markov Model, where they use the Bayesian Information Criterion (BIC) to select the number of model regimes. Their main conclusion is that in Europe, there are two groups of economies, and the optimum number of regimes across them is three. The first group tends to consist mainly of countries with developed and well-functioning financial markets, while the second consists of ones with less developed or recently negatively affected markets. The question of whether all countries are appropriately modelled by a three-state HMM is left to further research.

There are also some applications that leverage stock market data to detect systemic financial market phenomena. De Angelis and Paas (2013) use an HMM to detect financial crises and mark their ends in order to support investors' decision-making. Their proposed HMM is found to outperform an alternative state-of-the-art threshold General Autoregressive Conditional Heteroscedasticity (GARCH) model, thus showing the superiority of the HMM approach. Shi & Song (2012) use propose using an Infinite Hidden Markov Model (iHMM) to detect speculative bubbles. They show the utility of this approach by applying it to the Argentinian money aggregates over the period 1983 to 1989, as well as to the US oil prices from 1983 through 2010. Another line of applications of HMM includes the detection of stock price manipulation (Cao et al., 2013; Cao et al., 2014).

3. Multiple Regimes and Markov Switching

3.1. General Overview of the Hidden Markov Model

This paper leverages a relatively long data series spanning over 15 years of daily market data in 24 European markets to estimate a Hidden Markov Model and thus be able to discern the different states in which those markets have functioned. Here we present a short overview of the HMM, based on Nguyen (2018). The Hidden Markov Model assumes a number of states N and observed data of length T, which we denote as O:

$$O = \{O_t, t = 1, 2, 3, \ldots, T\} \tag{1}$$

There is also a sequence of hidden states (Q) and a number of possible values for each state, S, where those are defined as follows:

$$Q = \{q_t, t = 1, 2, 3, \dots, T\} \ and \ S = \{S_i, i = 1, 2, 3, \dots, N\} \tag{2}$$

There are v_k symbols per given state that characterize it. The model calculates the likelihood of realized observations and stores this in the observation probability matrix **B**, where:

$$\mathbf{B} = (b_{ik}): b_{ik} = P(O_t = v_k | q_t = S), i = 1 \dots N, k = 1 \dots M \tag{3}$$

As a final step, the model characterizes the probabilities of staying in the current state or switching to another one. Those are summarized in the probability transmission matrix, **A**. This is defined as follows:

$$\mathbf{A} = (a_{ij}): a_{ij} = P(q_t = S_j | q_{t-1} = S_i), i = 1 \dots N, j = 1 \dots N \tag{4}$$

The hidden Markov model can be thus characterized by the probability transmission matrix, the observation probability matrix and the vector of initial probabilities of being in a given state (denoted p). A compact notation of the Hidden Markov model λ is as follows:

$$\lambda \equiv \{A, B, p\} \tag{5}$$

With a continuous distribution of probabilities, as is the case with stock market prices and returns, the resulting Hidden Markov Model is also a continuous one. Should the observation probabilities data be normally distribution, then we have the following:

$$b_i(O_t) = N(O_t = v_k, \mu_i, \sigma_i) \tag{6}$$

Denoting the mean and standard deviation of this distribution as μ and σ, respectively, the Hidden Markov model in Eq. (5) reduces to:

$$\lambda \equiv \{A, \mu, \sigma, p\} \tag{7}$$

There are three key HMM estimation problems to be solved. The first one is calculating the probability of observations $P(O|\lambda)$ given observed data and model parameters. This is usually tackled by forward or backward algorithms (Baum, Egon, 1967; Baum, Sell, 1968). The second problem is to calculate the best state sequence of observations $Q = \{q_1, q_2, \dots, q_T\}$ again given the data at hand and the model parameters. This is accomplished by the Viterbi algorithm (Viterbi, 1967). The third and final calculation issue for HMMs is to calibrate the model parameters $\lambda = \{A, B, p\}$ using the available data. This is accomplished by applying the Baum-Welch algorithm (see Baum, Petrie, 1966). The latter is then extended in work by Levinson et al. (1983) and Li et al. (2000). Finding numeric solutions to those three problems can sometimes be challenging. To this end, we use the Expectation Maximization (EM) algorithm, proposed by Hamilton (1989, 1990). Essentially, the EM method maximizes the likelihood function of the HMM that can be used in general cases (Mizrach, Watkins, 1999). This method was later expanded and elaborated by Goldfeld & Quandt (2005) and developed for use in the R language for statistical programming by Sanchez-Espirages & Lopez-Moreno (2015). It is precisely this implementation that we use to estimate our HMM parameters.

3.2. Selecting the Number of Regimes

Hidden Markov Models can be a powerful tool to develop a subtler and more nuanced view of how markets operate by understanding their current state (or regime), estimating their parameters, and then reacting accordingly. While this can be a purely data-driven process, the key question of how many regimes there are remaining open. Preferably, the researcher will be able to estimate that from data rather than simply assume a plausible number. Still, some work in the field has taken the second route and posited that a likely number of states might very well be two, accounting for growth and fall conditions. While informative, one may want to further study whether a higher-order HMM is a better fit for data.

Noting the importance of the likelihood function for this end, some authors have proposed to use of a visual approach to understanding this. Plotting the likelihood function for a number of regimes, an observable kink in the line signals the desired order. This is somewhat informal and can be rather imprecise, which is why the usual way to approach regime selection is by resorting to information criteria (Pohle et al., 2017). Essentially, an information criterion is a measure of the quality of a given model based upon the informational loss this model entails. It is best used to compare alternative models fit on the same dataset and allows the researcher to take heed of the tradeoff between model quality (fit) and parsimony (number of model parameters). As Hidden Markov Models with a different number of regimes are calculated, one can estimate their criteria and select the ones with the lowest values.

Among the most commonly used criteria are the Akaike Information Criterion (AIC), the Consistent Akaike Information Criterion (CAIC), the Bayesian Information Criterion (BIC), and the Hannan-Quinn Information Criterion (HQC). Either one or more of those can be used to determine the number of states and this may also need to take into account the specific model context, the need for parsimony and issues of computational ease (Ngyuen, 2018). The likelihood function of the model shows the probability of observing the data given this specific model with its parameter set. This is denoted as L. We denote the number of observations with M, and the number of parameters in the parameter set – with k. If the distribution corresponding to each of N hidden states is a normal one, then the following holds true:

$$\lambda \equiv \{A, \mu, \sigma, p\} \tag{8}$$

The Akaike criterion (AIC) is then defined as follows:

$$AIC = -2\ln(L) + 2k \tag{9}$$

AIC has some issues, most notably that it is valid asymptotically and, in some situations, adjustments need to be made to take into account finite sample sizes. An alternative to AIC is the consistent AIC (CAIC) which is then defined as follows:

$$CAIC = -2\ln(L) + k(\ln(M) + 1) \tag{10}$$

Another popular and well-used information criterion is the Bayesian one (BIC). It should be noted that BIC is valid as M≫k, which is clearly the case with the current data under study. The BIC definition is given by the following:

$$BIC = -2\ln(L) + k\ln(M) \tag{11}$$

Finally, the Hannan-Quin criterion may be used for model selection. While it may not be asymptotically efficient, it is still well-behaved and consistent – and thus, a viable choice. The HQC is given by the following:

$$HQC = -2\ln(L) + k(\ln(M)) \tag{12}$$

In line with the literature and in order to ensure consistency and comparability of results, this paper takes a two-pronged approach. Initially, we assume a simple 2-state HMM and estimate parameters (returns and risk) for the European markets within this framework. Second, we fit a number of Markov Models and choose the optimal ones given the values of the Akaike and Bayesian information criteria (see Eqs. (10) and (11), respectively). The next section proceeds with a preview of data used for this fit and outlines a few key facts about the stock markets under investigation.

4. Data and Stylized Facts for European Stock Markets

European stock markets have had tumultuous dynamics over the period from 2006 to 2020. We leverage publicly available data from the Stooq platform spanning a 15-year period beginning 1st January 2006 and ending 31st December 2020 to study them in more detail. The focus is on 24 selected European stock market indices (see Table 1), each of them having full data for the period – a total of 3838 observations each. Data is automatically downloaded and processed via replicable scripts in the R programming language for both visualization and model estimation.

It should be noted that changing the span of the time series will likely generate slightly different parameter estimates. However, the period 2006-2020 seems relatively representative as it covers both periods of growth, as well as two large crises – the global financial crisis of 2007-2008 and the COVID pandemic that began in early 2020. The sample under study thus covers at least one full economic cycle.

In contrast to US-based indices, which showed an overall upward trend despite the global financial crisis that started in 2007-8, and the coronavirus pandemic of 2020, some European indices never recovered their levels from the beginning of the period (see Figure 1). Developed and sophisticated European economies such as Germany, France, and the United Kingdom have broadly followed the global stock market trends – after an initial fall in 2008, they mostly recouped the losses and registered growth as the economic recovery was gaining traction. The coronavirus pandemic in early 2020 led to a steep decline, but it has been mostly offset by gains in the next months. This is hardly the case with embattled economies in the South.

Figure 1. Dynamics of Selected European Stock Markets, 2006-2020
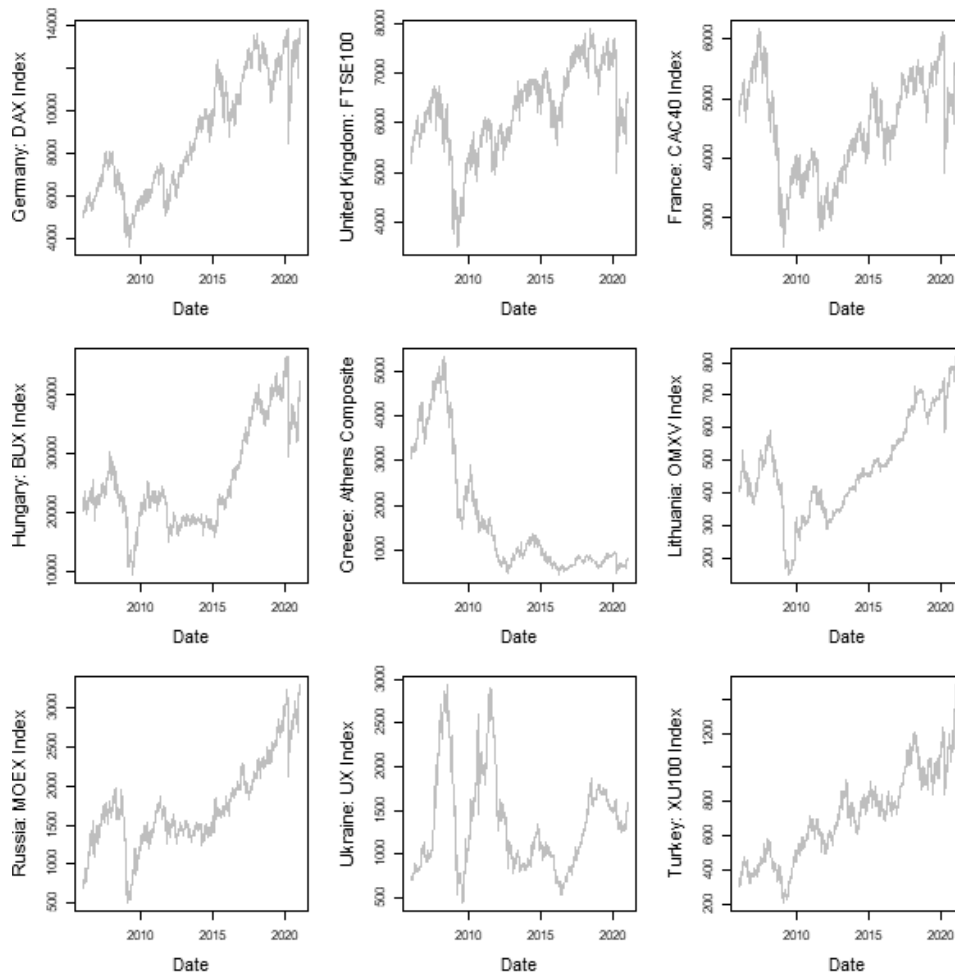
Source: Stooq Database.

Countries like Greece and Portugal experienced steep declines that were never recouped, and their stock markets have largely seen stagnation. Finally, a third group of countries that lies at the periphery of the European Economic Area (EEA) is characterized by yet another type of dynamics. Countries such as Russia and Turkey have registered a robust growth over the past fifteen years and have been largely unphased by the occasional declines driven by a deterioration in global fundamentals. Finally, Ukraine has been plagued by a constellation of heightened political, military and economic risks and has specific individual dynamics – twin peaks of growth followed by an unsteady recovery.

Table 1. Risk, return and simple equity risk premia in selected European stock markets

Country	Exchange	Index	Average Return, %	Equity Risk Premium, %	Risk (Std. Dev.), %
Belgium	Euronext Brussels	BEL20	2.91	1.42	21.93
Bulgaria	Bulgarian Stock Exchange	SOFIX	3.57	2.07	32.35
Czechia	Prague Stock Exchange	PX	-0.03	-1.52	19.91
Estonia	Estonian Stock Exchange	OMXT	10.22	8.73	31.95
Finland	Helsinki Stock Exchange	HEX	4.65	3.15	21.08
France	Euronext Paris	CAC	2.79	1.29	17.76
Germany	Deustche Boerse	DAX	8.40	6.91	19.61
Greece	Athens Exchange, Athens Composite	ATH	-2.84	-4.33	34.25
Hungary	Budapest Stock Exchange	BUX	8.88	7.39	29.31
Italy	Borsa Italiano	FMIB	-0.80	-2.29	20.38
Latvia	Latvian Stock Exchange, Riga	OMXR	6.83	5.33	24.94
Lithuania	Vilnius Stock Exchange	OMXV	8.88	7.39	28.07
Netherlands	Amsterdam Stock Exchange	AEX	4.73	3.24	19.77
Norway	Oslo Stock Exchange	OSEAX	9.97	8.47	23.18
Poland	Warsaw Stock Exchange	WIG20	0.51	-0.98	21.49
Portugal	Euronext Lisbon	PSI20	-0.77	-2.27	23.19
Romania	Bucharest Stock Exchange	BET	8.13	6.63	28.97
Russia	Moscow Exchange	MOEX	15.70	14.21	41.03
Spain	Bolsa de Madrid	IBEX	-0.06	-1.56	19.26
Sweden	Stockholm Stock Exchange	OMXS	6.43	4.94	19.62
Switzerland	Swiss Exchange	SMI	3.55	2.06	15.65
Turkey	Istanbul Stock Exchange	XU100	16.36	13.84	38.54
Ukraine	Ukraine Stock Exchange	UX	18.09	16.59	55.93
United Kingdom	London Stock Exchange, FTSE 100	UKX	1.91	0.42	13.90

Source: Stooq Database and author's calculations.

Fundamental market characteristics also vary widely across European stock markets (see Table 1). The average annual returns vary from the highs of Ukraine (18%), Turkey (16%), and Russia (15.7%) to negative average returns over the period as a whole – here, Greece particularly stands out with a -2.8% but a number of other stock market indices in other countries also register long-run returns below zero – Italy (-0.8%), Portugal (-0.8%), Slovakia (-0.3%) and Spain with a return around zero. The risk-return tradeoff holds quite nicely in European data, with the highest levels of return also being accompanied by higher standard deviations – a proxy for risk. The largest standard deviations are expected to be registered for Russia, Turkey, and Ukraine. However, almost all European markets are characterized by high levels of volatility which are sometimes set against the backdrop of relatively modest positive or even negative annual returns.

Table 1 also presents an indicative estimate of the equity risk premium across the European market. We calculate it as the difference between the returns of a reference riskless asset and the actual index returns (Damodaran, 2020). While this approach has a number of well-known potential complications (see Siegel, 2017 and references therein), it still serves as a reasonable proxy for the actual equity risk premium. A potential issue here is the determination of the riskless return. Considering that European stock markets are quite open (especially within the European Union) and almost all investors do have access to buying German bonds, we select the German government's 10-year treasury bond yield as the

reference. We use the daily quotes of the bond, thus allowing for the daily dynamics of the risk-free rate proxy over the period under study.

The calculated equity risk premia imply that there are drastically different levels of risk across different European stock markets. This is in consonance with what one concludes from surveying the volatility levels of the indices. While it is clear that those results are partly driven by the global financial crisis of 2007-2008, the ensuing sluggish recovery, and the coronavirus pandemic that hit Europe hard at the beginning of 2020, they are markedly different from the dynamics of other developed economies. This merits further study and necessitates the development of a more nuanced understanding of how stock markets in Europe function. A final important fact for European stock markets is that they are highly interconnected. Investigating the correlational structure between annual index returns reveals high relations across practically all markets in Europe (see Figure 2). Those correlations are medium to large in size and statistically significant. The only notable exception is the Istanbul stock market index which shows negative correlations with most other stock markets. The strong links between markets indicate some success in Europe's economic integration goals. On the other hand, risk hedging is made more difficult as all markets tend to move in the same direction, thus diminishing the benefits of diversification across different geographies.

Figure 2. Annual return correlations across selected European stock markets, 2006-2020, grouped via hierarchical clustering
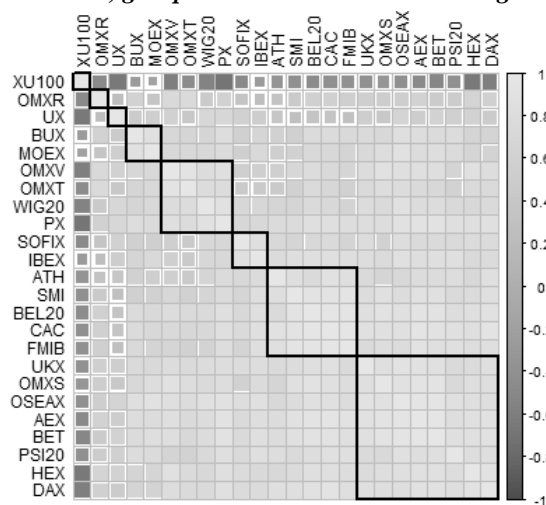
Source: Stooq Database and author's calculations.

In order to outline clusters of highly correlated markets, we grouped index correlations using hierarchical clustering. This exercise reveals three larger clusters of stock markets that tend to be intimately connected. The first one corresponds to central European countries and encompasses the market indices in Poland, the Czech Republic, Estonia, and Latvia. The second cluster approximately reflects the tight relationship in the centre and South of the continent around the gravity of the French and Italian economies and is underlined by the high correlations between the stock exchanges in France, Greece, Italy, Switzerland and

Belgium. The final cluster contains the most developed economies in western Europe and is dominated by Germany, the Netherlands, the United Kingdom, and the Nordics.

Some more isolated markets, such as the stock exchanges in Turkey, Russia, Ukraine, and a few others, do not belong to any clearly defined cluster. Those insights roughly correspond to the results obtained by Dias et al. (2015), whereby they find three large groupings of economies on the European continent, also distinguished by their levels of economic development and financial markets sophistication. However, one needs to also keep in mind that the correlations between markets hold over a longer period but not necessarily over a shorter one. Figure 2 presents the correlational structure of daily returns and here, we observe much less linkage and dependence as contrasted to the correlational structure of annual returns. The large cluster of central and western European markets persists, as does the cluster of southern markets. The rest turn out to be much less linked.

Figure 3. Daily return correlations across selected European stock markets, 2006-2020, grouped via hierarchical clustering
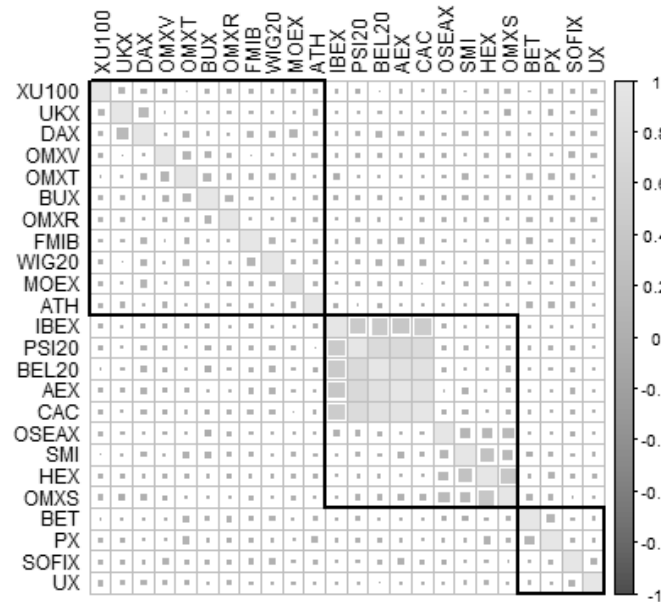
Source: Stooq Database and author's calculations.

Those stylized facts spell a very nuanced risk landscape in Europe and call for a more careful approach to risk management and portfolio choice. High correlations of annual returns show that investors can only achieve diversification and risk reduction in European markets if they make portfolio optimization decisions at a much lower level of granularity – e.g. on a daily basis where the market is not so tightly synchronized. The time structure of these correlations may need to be exploited as some markets react with a lag to overall downturns. All this points clearly to the need to understand daily market dynamics and be able to discern the

current regimes they operate in, and the probability of switching to another one. The next section presents the application of a Hidden Markov Switching Model to these ends.

5. Estimating Regime Number and Parameters

European stock markets have had tumultuous dynamics Data on 24 European stock market indices is leveraged to fit the optimal Markov Switching model on those. Following the guidelines for parsimony, we calculate 7 different models for each index with a number of different regimes varying from 2 to 8. Those models are then compared against each other using the Akaike and Bayesian information criteria. With almost no exception, both criteria give favour to models with a very limited number of regimes showing the lowest values for 2-regime models. This makes both intuitive sense as markets are colloquially described as bear and bull markets, implying two modes of operation, and is in consonance with a large body of research literature. Since the two regimes calculated by the HMM may not completely cover the definitions of bull and bear markets but merely approximate their qualitative properties, we may instead call them bullish and bearish market regimes. Thus, the bullish market regime is expected to generate higher returns with lower volatility with respect to its bearish counterpart. The second analytic step is to estimate a 2-regime Hidden Markov Model for each market, and their respective parameters and switching probabilities are calculated using consequently the forward algorithm for computing the probability of observations, the Viterbi algorithm for estimating the best state sequence, and the Baum-Welch algorithm for calibrating model parameters.

Figure 4. Regimes in the FTSE100 index returns: bullish and bearish periods (top panel) and regime probabilities (bottom panel)
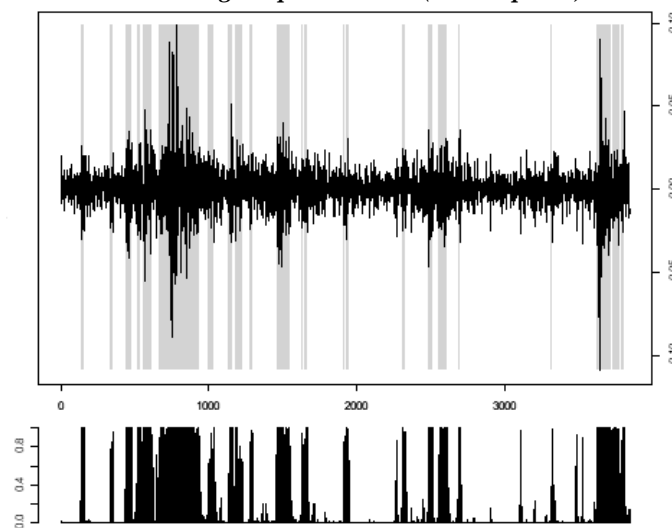
Source: Stooq Database and author's calculations

The HMM is able to designate each daily return under study as belonging to one of the two regimes with a different probability. An example case in point would be the UK's FTSE100 index, visualized in Figure 3. Most of the time, the market is in Regime 1 (bullish) with positive average returns of 0.05% daily. However, there are some turbulent times during which the market switches to the bearish Regime 2 (shaded regions in Fig. 4) where average daily returns turn negative to a -0.10% and the volatility increases significantly by two and a half times. The mode results are derived with high fidelity as most regime switches are based on high probabilities and not on a decision around the cut-off point. Similar dynamics can be observed across all European stock markets (see Table 2).

Under the bullish market regime, daily returns in European stocks are positive and mostly fall in the range of 0.05% to 0.1%, with relatively low volatility as proxied by standard deviations of 0.4% to around 1.2%. However, as the regime changes, market dynamics become very different. The average returns notably decline and, in all but one market, turn negative. Surprisingly, the lowest falls are not necessarily observed only in the riskiest markets – the steepest decline is seen in the Istanbul stock exchange, with average daily returns reaching -0.24%, followed by the Greek stock exchange (-0.20%), the Prague stock exchange (-0.19%) and the Swiss stock exchange (-0.17%).

Table 2. Risk and return under two different regimes in selected European stock markets

Exchange	Index	Regime 1: Bullish Market (%)		Regime 2: Bearish Market (%)	
		Returns	*Std. Dev.*	*Returns*	*Std. Dev.*
Euronext Brussels	BEL20	0.07	0.77	-0.14	2.06
Bulgarian Stock Exchange	SOFIX	0.02	0.58	-0.11	2.17
Prague Stock Exchange	PX	0.05	0.81	-0.19	2.64
Estonian Stock Exchange	OMXT	0.04	0.49	-0.02	1.85
Helsinki Stock Exchange	HEX	0.08	0.86	-0.14	2.14
Euronext Paris	CAC	0.07	0.86	-0.12	2.20
Deustche Boerse	DAX	0.09	0.92	-0.13	2.29
Athens Exchange, Athens Composite Index	ATH	0.07	1.25	-0.20	3.09
Budapest Stock Exchange	BUX	0.06	0.99	-0.07	2.51
Borsa Italiano	FMIB	0.05	1.10	-0.16	2.70
Latvian Stock Exchange, Riga All-shares Index	OMXR	0.04	0.70	0.01	2.38
Vilnius Stock Exchange	OMXV	0.05	0.42	-0.07	1.90
Amsterdam Stock Exchange	AEX	0.07	0.81	-0.14	2.21
Oslo Stock Exchange	OSEAX	0.09	0.90	-0.12	2.43
Warsaw Stock Exhange, 20	WIG20	0.04	1.05	-0.08	2.36
Euronext Lisbon	PSI20	0.06	0.84	-0.21	2.06
Bucharest Stock Exchange	BET	0.06	0.72	-0.06	2.56
Moscow Exchange	MOEX	0.09	1.08	-0.09	3.72
Bolsa de Madrid	IBEX	0.05	0.96	-0.11	2.35
Stockholm Stock Exchange	OMXS	0.08	0.84	-0.09	2.15
Swiss Exchange	SMI	0.07	0.74	-0.17	2.00
Istanbul Stock Exchange	XU100	0.12	1.21	-0.24	2.72
Ukraine Stock Exchange	UX	0.07	1.05	-0.06	3.46
London Stock Exchange, FTSE 100	UKX	0.05	0.72	-0.10	1.94

Source: Author's calculations.

The great difference between the states is also manifest itself in the very different volatility values. Under the bullish market, we observe volatilities of around or under 1%, with the highest being in Athens (1.25%), Istanbul (1.21%) and Italy (1.10%). However, as the market turns bearish, the volatility increases three or four times and its average value jumps from 0.86% into the calm Regime 1 all the way to an average of 2.41% under Regime 2. Embattled countries that have witnessed economic problems over the period of study consistently register the highest stock market index volatilities under the bearish regime. The highest standard deviation is registered in the Russian stock market (3.76%), followed by the Ukrainian and Greek ones with 3.46% and 3.09%, respectively. Remarkably, across Europe, there is really no safe haven during bearish markets – all the rest of the indices register high fluctuations in the range of 2-3% daily under Regime 2. This shows that while bearish markets may vary widely across European stock exchanges, bullish markets have strikingly similar characteristics in terms of volatility.

Table 3. Transition probabilities in two different regimes in selected European stock markets

Exchange	Index	Regime 1: Bullish Market (%)		Regime 2: Bearish Market (%)	
		Prob. to Stay	*Prob. to Switch*	*Prob. to Stay*	*Prob. to Switch*
Euronext Brussels	BEL20	98.08	1.92	95.36	4.64
Bulgarian Stock Exchange	SOFIX	97.17	2.83	89.15	10.85
Prague Stock Exchange	PX	98.92	1.08	95.28	4.72
Estonian Stock Exchange	OMXT	96.82	3.18	91.03	8.97
Helsinki Stock Exchange	HEX	98.96	1.04	97.34	2.66
Euronext Paris	CAC	98.24	1.76	96.04	3.96
Deustche Boerse	DAX	98.78	1.22	96.22	3.78
Athens Exchange, Athens Composite Index	ATH	98.15	1.85	95.82	4.18
Budapest Stock Exchange	BUX	98.61	1.39	95.92	4.08
Borsa Italiano	FMIB	99.06	0.94	96.79	3.21
Latvian Stock Exchange, Riga All-shares Index	OMXR	97.04	2.96	89.03	10.97
Vilnius Stock Exchange	OMXV	96.21	3.79	88.12	11.88
Amsterdam Stock Exchange	AEX	98.90	1.10	96.72	3.28
Oslo Stock Exchange	OSEAX	98.96	1.04	96.87	3.13
Warsaw Stock Exchange, 20	WIG20	99.18	0.82	97.29	2.71
Euronext Lisbon	PSI20	98.04	1.96	94.20	5.80
Bucharest Stock Exchange	BET	97.44	2.56	93.00	7.00
Moscow Exchange	MOEX	99.03	0.97	96.05	3.95
Bolsa de Madrid	IBEX	98.92	1.08	97.35	2.65
Stockholm Stock Exchange	OMXS	98.78	1.22	97.22	2.78
Swiss Exchange	SMI	98.92	1.08	95.79	4.21
Istanbul Stock Exchange	XU100	98.18	1.82	92.70	7.30
Ukraine Stock Exchange	UX	97.03	2.97	89.77	10.23
London Stock Exchange, FTSE 100	UKX	98.68	1.32	96.56	3.44

Source: Author's calculations.

A final insight from the Markov modelling is the remarkable persistence of regimes in European stock markets. If the index finds itself in bullish territory, the likelihood that it remains in it is in the range of 96% to 99%, leaving only a very small chance that a switch to

a bearish market will occur. Similarly, once in a bearish market, an index has an average chance of 95% to remain bearish and only 5% to switch to the other regimes. Those averages naturally conceal individual country differences. Stock markets in countries like Lithuania, Latvia, Bulgaria and Ukraine have a much higher probability of switching in the range of 10-11%, while markets such as the Helsinki, Stockholm, Warsaw and Madrid stock exchanges register up to five times lower probability to do so. The high degree of inertia opens clear possibilities for risk hedging – once the HMM has successfully identified the current state of the market, it is highly likely that this will persist over the next period.

Figure 5. Regimes across Selected European Stock Markets: bullish (white) and bearish (shaded)
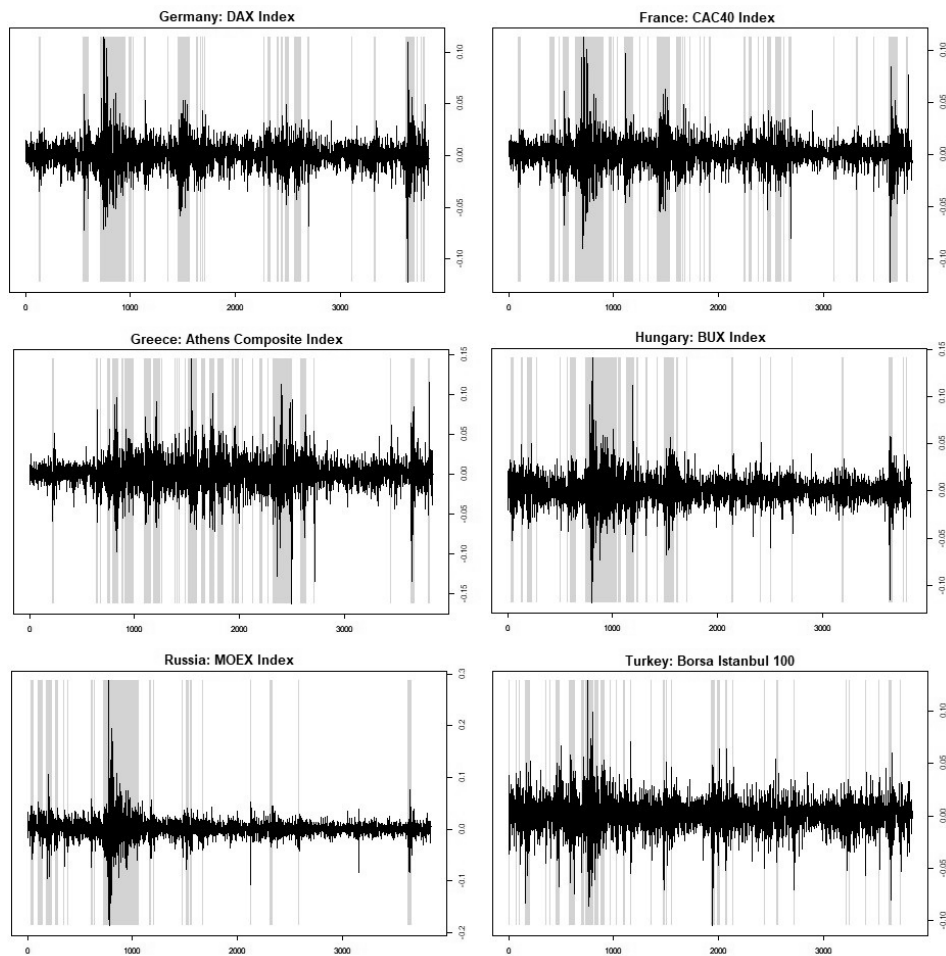
Source: Stooq Database and author's calculations.

A final pertinent point about risk diversification in European stock markets is the synchronization of different states. Should states be perfectly synchronized, risk reduction through capital transfers to an alternative stock exchange would not be possible. Conversely, the greatest possible degree of diversification can be obtained in two markets that have exactly opposite regime sequence. Figure 5 shows the synchronization pattern of six selected indices, whereby we observe imperfect correlation of state sequences. All markets are affected by the global financial crisis that began in 2008 in Europe and they simultaneously switch from a positive-return low-volatility bullish state to a high-volatility and low-return bullish ones. In this episode, synchronicity across markets is always perfect, thus making this episode an instance of non-diversifiable risk.

On the other hand, there are also many idiosyncratic regime switches across markets whereby some stock indices experience high volatility, while others remain in the calmer regime. Additionally, even when the overall regime sequences may coincide across markets, there is rarely perfect coincidence on a daily basis. For example, while the German and the French indices are roughly correlated, the regime switching does not necessarily occur on the same date, and this is particularly obvious in data from the turbulent 2020. Essentially this means that capital may find a safe haven moving away from markets with highly persistent bearish states into ones with highly persistent current bullish states.

This exercise in risk management has to be based on a daily analysis of current regimes and transition probabilities. Figure 5 also gives a new perspective on insights about returns correlations. Market indices that tend to be negatively correlated, such as the Istanbul stock exchange index on the one hand, and the CAC40 or Athens Composite, on the other, also display a significantly different regime structure. It is the change of the underlying market state that produces different returns and volatilities, which then result into overall negative correlations between markets. The study of regime switching thus has not only practical risk diversification and portfolio management implications but can also enable a deeper understanding of fundamental market functioning.

6. Implications and Conclusion

The selection and estimation of Hidden Markov Models to 24 European stock market indices revealed a number of insights. First, it supports the common wisdom and research results that markets are characterized by a limited number of very different states – e.g., bear and bull markets. The HMM selection made here is predicated on information criteria that clearly show the superiority of models with a small number of two or three states. Second, those states have very different characteristics, with one of them (bullish) being characterized by positive returns and low volatility, while the other one (bullish) – by overwhelmingly negative returns and a much higher level of fluctuations. Third, those states are remarkably persistent, with an average probability of switching from the calmer to the riskier state of less than 2%. However, when the switch does occur, the mode of market functioning is truly different and easy to detect. Fourth, the regime-switching is not perfectly synchronized across European markets and while there may be identical patterns, there are also many idiosyncratic episodes.

The results presented constitute a necessary but not sufficient condition for diversification and active management of an investment portfolio in European stocks. On the one hand, HMM regime estimation gives a clear indication of the risk-return tradeoff in all different markets under their two modes of operation, thus enabling the portfolio manager to select an optimal market for the current period, given their constraints. Detection of the current regime enables better estimation of expected returns given the current mode of operation and the expected volatility to be encountered. Transition matrices, on the other hand, provide the investor with a more sophisticated view of market persistence. Finally, leveraging regime detection and regime switching detection allows the coordinated movement of capital from markets with undesirable current regimes to those with more favourable ones. As European stock indices do not seem to be perfectly coordinated, this holds the promise of enabling further diversification and enabling better results than the strategy of simply taking and passively holding positions across markets.

On the other hand, investors will need to bear in mind not simply the asynchronous nature of stock markets but also other relevant characteristics that may need to be present in order for actual diversification opportunities to exist in practice. Among those, the liquidity, depth and breadth of markets, and the ensuing transaction costs and tax considerations readily come to mind. It may thus be of more interest of large institutional investors to focus on regime divergence between sizeable and liquid markets such as the stock markets in Germany, France, Italy, and the UK. Those markets will likely provide the necessary volume so that portfolio managers can easily reap the benefits of diversification. Conversely, small and illiquid markets may be of interest to smaller niche investors that require less market depth and may be under more liberal regulatory regimes. All in all, the results from the HMM should be considered as one of many tools of modern portfolio selection and management.

This paper has demonstrated how the application of Hidden Markov Models to European stock market indices enables the analyst not only to better estimate key market parameters and manage risk but also to gain a deeper understanding of the fundamental modes of operation of those stock markets. Even a simple and parsimonious Markov model with two regimes are able to succinctly capture different market dynamics and enable the study of the deeper drivers of those two distinct states. Markov models also reveal the structure of market correlations at a very granular level by showing state and regime switching patterns. This opens fruitful venues to study how markets are interconnected and what causes the lags between regime switching in different countries and stock markets. Further research into HMMs is needed to fully integrate this tool into the asset price forecasting and portfolio selection process and some progress is already being made. Work remains to be done in expanding the scope of application in terms of both investment tasks and alternative markets and investments, as well as conducting studies at the lower level of granularity of specific assets. Still, existing results indicate the significant utility of HMMs for both research and practical endeavours.

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DETERMINANTS OF THE CAPITAL STRUCTURE OF NON-LISTED COMPANIES IN KOSOVO[4]

The main objective of the study was to examine the determinants of the capital structure of Kosovo companies reporting to the Kosovo Council for Financial Reporting (KCFR). The data is collected from the financial statements of 50 non-listed companies and covers the time period of 2013-2018. The data is pannel and three different models: fixed, random effects, and pooled OLS, were estimated in order to test for the best-fitted model of the determinants of the capital structure of Kosovo companies. The size of the company, liquidity, profitability, assets structure, growth, effective tax rate, financial flexibility, and risk were used as explanatory variables for the capital structure of a company measured by the total debt rate. Several theories of capital structure have been developed to explain company-based capital structure. This study is based on the selection of trade-off and pecking order theory. The results of the study suggest that variables such as the size of a company, assets structure, growth, and financial flexibility influence the measurement of the capital structure of a company in Kosovo, and they are supported by the trade-off and pecking order theory. From the results, we can conclude the negative relationship between the size of a company, liquidity, profitability, assets structure, financial flexibility, risk, and capital structure, affects the management of the company when making borrowing choices. The findings of the study demonstrated the importance of capital structure compounds for the decision on the financial sources of a company in Kosovo.
Keywords: Kosovo; determinants of capital structure; trade-off; pecking order; company
JEL: D25; G3; G3

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1. Introduction

The capital structure of a company plays an important role in its financial performance, sustainability, growth, and ability to accomplish its long-term goals and objectives. The capital structure of a corporation is the method by which a company funds its assets and it displays the mix of financial instruments used to finance its investments. In general, the capital structure for funding a corporation reflects the different combinations of debt and equity. By mixing debt and equity, the capital structure of a company may have the majority of the debt or the majority of the capital component. However, achieving a reasonable balance between the debt and the equity component is believed to be crucial for a successful organisation. The combination of capital and debt can be stated in three ways: a) 100 percent equity and 0 percent debt; b) 0 percent equity and 100 percent debt; and c) X percent equity and Y percent debt (Olokoyo, 2013). This mix is the percentage of diverse sources within the company, and these sources include both internal and external financiers. Moreover, financial circumstances in the corporate sector not only impact the financial performance of a company but also have a powerful effect on macroeconomic results (Martis, 2013). Choices connected to the capital structure constitute an exchange between risk and return (Kiran, 2013).

According to Kiran (2013), the highest usage of debt raises the company's liabilities, which subsequently increases the risk of profits, but at the same time, may increase expected returns in the future. Despite the theoretical breakthroughs that have taken place in recent years, our knowledge of the corporate capital structure requires additional examination (Beattie, Goodacre, & Thomas, 2006). The majority of the empirical research assessing the determinants of a company's financial structure concentrates on listed companies, whereas our study focuses on the financial structures of non-listed companies in Kosovo. The main aim of this study is to develop a base of key determinants of the capital structure of Kosovo companies. It examines the financial behaviour of Kosovo companies by addressing the issue of capital structure and supports the trade-off or pecking order theory for non-listed companies. Furthermore, the research focuses on identifying factors before making financing choices, the influence of these factors on the value of a company, and how the capital structure represents the future goals of a company.

The remainder of the paper is organised into the five following sections. Section 2 includes a literature review of the capital structure. Section 3 describes empirical evidence on determinants of the capital structure. Section 4 comprises data collection and research methodology. Section 5 presents results and discussions, and the last section provides conclusions from the results of the study and ideas for additional research.

2. Literature Review

Despite the difficulty of determining a company's financial structure, it is critical to its success. Decisions on the company's financial structure are critical to its survival. Capital structure choices are among the most complex and difficult for the owners and managers of a business. A wrong decision about the capital structure can lead to financial difficulties and,

ultimately, may lead to the bankruptcy of a company (Alipour, Mohammadi, & Derakhshan, 2015).

According to a number of studies, companies differ greatly in their financial structures. A company's capital structure consists of both debt and equity (San & Heng, 2011), (Pouraghajan & Malekian, 2012). A company's capital structure is defined by Abor and Biekpe (2009) as the particular combination of debt and equity that it utilises to fund its business operations. Some companies use debt as a main source of financing, while other companies may solely rely on capital, and for others, a combination of both sources may be an appropriate solution. All these combinations of financial sources depend on the orientation of the company for the use of financial sources. Depending on the company's financial strategy, any one of these combinations of sources may be used.

Earlier theories, such as the theory of capital structure, begin with the theorem of Modigliani & Miller (M&M). Modigliani and Miller theory foresees the capital structure as a result of mainly financial, tax, and growth factors (Modigliani & Miller, 1958). The M&M theory established the basis for modern thinking about capital structure, according to which the value of a company is independent of its capital structure. The basic theorem states that in the absence of taxes, bankruptcy costs, agency costs, asymmetric information, and an efficient market, the value of a company is not affected by the way it is financed. Since the company's value does not depend either on its dividend policy or on its decision to raise capital by issuing shares or selling debt, the M&M theorem is often called the principle of capital structure bias.

3. Determinants of Capital Structure

The pillars of a company's competitive advantage are the capital structure's determinants (Kumar, Colombage, & Rao, 2017). Accordingly, the next section examines many studies on the factors that influence companies' capital structures, utilising the total debt ratio as a dependent variable and size, liquidity, profitability, asset structure, growth, effective tax rate, financial flexibility, and company risk as independent variables.

Total debt ratio

According to Chen J. J. (2004), Handoo and Sharma (2014), the company's total debt ratio is calculated as total debt divided by total assets (Ibhagui, 2018). A company's capital structure is thought to be chosen by companies based on the characteristics that govern different aspects of the cost-benefit analysis correlated to debt and equity financing (Abor & Biekpe, 2009). The total debt ratio is a financial report that shows the percentage of a company's assets compared to its debt (Handoo & Sharma, 2014). But profitable companies depend more on debt as their main source of funding (Abor, 2005).

Size

Is there a correlation between the size of a company and its capital structure, and why? The contrast between small and big companies is presented in a variety of ways by a number of writers. For small companies, it may seem relatively costly to resolve the information asymmetry between lender and investor, which discourages the use of foreign investment (Grinblatt.M & Titman.S, 1998). According to Weston and Brigham (1981), the management of large companies should choose equity financing since the sale of additional shares has minimal influence on the control of large companies.

However, according to Barton and Gordon (1988), Kale, Noe and Ramirez (1991), there is a negative relationship between the size of a company and the level of debt. The existence of a negative relationship between these two variables explains the fact that large companies use less debt in their capital structure because of their ability to finance through issuing stock, rather than debt financing (Deloof & Overfelt, 2008). The pecking order theory predicts a similar pattern of relationships, with large corporations attracting less debt and generating more information asymmetries (Marsh, 1982). On the other hand, a positive relationship between the size and the debt ratio was reported by (Lim, 2012), (Chang, Chen, & Liao, 2014). Prasad, Green and Murinde (2001) also discovered a positive relationship between these two variables, but they noted that a positive relationship exists between long-term and short-term debt and company size.

Whereas, Du and Dai (2005) argued that size is often considered as a determinant of the capital structure where larger companies have more information to the public than smaller companies and may favour capital financing because the cost of capital financing due to asymmetric information is the smallest. Hence, size is negatively related to leverage, and this argument suggests that larger companies should have higher leverage. So reported Titman and Wessels (1988) according to the trade-off theory, as well as proving that relatively large companies tend to be more diversified and less prone to bankruptcy.

Rajabi and Ebrahimi (2020) suggested that investors focus on the growth opportunities of the company as a long-term tool and to devote more of their attention to the company's investments.

Liquidity

Liquidity may have both positive and negative consequences for a company's capital structure. A company's capacity to satisfy short-term liabilities increases when its liquidity is larger. On the other hand, high-liquidity companies may use it to fund their investments (Viviani, 2008). According to Deesomsak, Paudyal and Pescetto (2004), there is a negative relationship between liquidity and the debt ratio. A negative relationship between the two variables is supported by the pecking order theory, as liquidity companies have fewer funding requirements from external sources (Alipour, Mohammadi, & Derakhshan, 2015).

Differently, Vo (2017) assumes a positive relationship between these two variables since high liquidity companies can use a higher debt rate due to their greater ability to meet short-term liabilities. While Alipour, Mohammadi and Derakhshan (2015) stressed out that even

under the trade-off theory assumption, a positive relationship is expected between these two variables, due to sufficient debt provision in order to fulfil their commitments.

Profitability

There are many contradictions with regard to theories about the ratio between profitability and debt rate. According to the pecking order theory, companies prefer to use more internal resources. This means that there should be a negative relationship between profitability and debt (Tong & Green, 2005).

In line with the following researchers: Jordan, Lowe and Taylor (1998), Céspedes, González and Molina (2010), there was also a negative relationship between the variables (Chang, Chen, & Liao, 2014). Myers and Majluf (1984) suggest that profitable companies generate high incomes and tend to use less debt compared to less profitable ones. Hence, the most profitable company is allowed to deviate from external financing (Myers & Majluf, 1984).

When a company is profitable, it has the capacity to avoid debt by generating its own assets that are able to support its operations without relying on external funding (Barton & Gordon, 1988), (Krasniqi & Mustafa, 2011) and (Krasniqi, 2010). Profitability has a significant impact on capital structure (Al-Fayoumi & Abuzayed, 2009). In general, most profitable companies need to borrow less because they can rely more on domestic funds (Beattie, Goodacre, & Thomas, 2006).

On the other hand, according to the trade-off theory, the opposite result is expected. Most profitable companies, should prefer more debt to benefit from tax savings. Profitable companies are able to borrow more, which increases the possibility of a return on the money borrowed (Gaud, Jani, Hoesli, & Bender, 2005) and (Krasniqi, 2012). According to the trade-off theory, there may be a positive relationship between profitability and debt. In line with the authors, Chiarella, Pham, Sim and Tan (1992) and Abor and Biekpe (2009) showed via their research that there is a negative relationship between profitability and debt. As reported by Barton and Gordon (1988), a capital structure is the result of more than just economic factors, because profit is inversely related to debt levels.

Assets structure

A company's asset structure is a significant factor in determining its capital structure. It shows the ratio of fixed assets to total assets (Bevan & Danbolt, 2002); (Handoo & Sharma, 2014).

According to Harris and Raviv (1991), companies with more tangible assets exhibit higher liquidity values. When a company is liquidated, creditors see fixed assets as a kind of collateral that may be used to pay off their debts (Alipour, Mohammadi, & Derakhshan, 2015). In accordance with the static trade-off theory, fixed assets may serve as collateral and this is one of the reasons why fixed assets and debt should have a positive relationship (Mazur, 2007). On the other hand, the pecking order theory predicts that companies that

possess more tangible assets will be less likely to experience asymmetric information problems, suggesting a negative relationship (Mazur, 2007).

Numerous studies, including Esperança, Gama and Gulamhussen (2003), Céspedes, González and Molina (2010) and Vo (2017), demonstrated a positive relationship between the asset structure and the debt ratio. Antoniou, Guney and Paudyal (2002) also found a positive relationship based on research done in some of European countries. The relationship between the structure of assets and debt also depends on the amount of debt applied (Bevan & Danbolt, 2002).

Growth

Financial empiricists have historically agreed on the existence of a positive relationship between growth and debt rate, as reported by many authors (Grinblatt.M & Titman.S, 1998), (Allen & Mizuno, 1989), (Barton & Gordon, 1988). A positive relationship between growth and debt rate is also shown by Céspedes, González and Molina (2010), Chang, Chen and Liao (2014), since fast-growing companies have to finance their projects and this is mainly achieved through borrowing. Asset growth is required when a company has a significant volume of sales (Al-Fayoumi & Abuzayed, 2009).

On the other hand, there are other researchers who consider it possible to have a negative relationship between the debt rate and growth, as evidenced by (Rajan & Zingales, 1995), (Bevan & Danbolt, 2002). Handoo and Sharma (2014) suggest that capital debt reduction is a long-term goal for companies with great growth potential but unstable cash flow. Growth opportunities are capital assets that add value to a company but cannot be collateralised and do not generate actual taxable income (Titman & Wessels, 1988). Due to these arguments, a negative relationship is foreseen between debt and growth opportunities.

Tax effective rate

The tax rate is a rate that is determined depending on the company's profit, where different rates are used for different levels of profit (Handoo & Sharma, 2014). For companies, the loan interest is deductible from the taxable financial results, and for that reason, companies with higher tax liabilities are encouraged to use more debt. Therefore, a positive relationship between the effective tax rate and leverage ratio is expected (Haugen & Senbet, 1986) However, Antonou, Guney and Paudyal (2008) claimed that this logic only applies if companies are able to generate significant taxable revenue. Lower domestic funds and more capital expenses would be the effects of higher corporation tax rates.

By integrating tax benefits into their theory, M&M concluded that corporations use debt financing in order to take advantage of tax advantages while also maximising the market value of their companies. More debt in the capital structure is recommended by M&M. When interest payments are completely deductible in the computation of corporate income tax, Miller M. H. (1977) argues that the value of a company in equilibrium will still be independent of its capital structure.

Other researchers such as Jordan, Lowe and Taylor (1998) and Alipour, Mohammadi and Derakhsha (2015) emphasise that there is a positive relationship between the effective tax rate and the debt rate. A positive relationship between variables is also supported by the trade-off theory (DeAngelo & Masulis, 1980).

Otherwise, the pecking order theory does not establish a relationship between the level of debt and the effective rate of taxation (Karadeniz, Kandir, Balcilar, & Onal, 2009). While Antonou, Guney and Paudyal (2008) emphasised that the effect of this rule on the capital structure depends on the tax regulations of each country.

Financial flexibility

Financial flexibility may have an influence on the value of a company. The influence of financial flexibility on the value of a company is fairly considerable (Byoun, 2011). Financial flexibility refers to the ability of a company to mobilise its financial resources in order to adopt preventative and exploitative steps in the foreseeable future. It anticipates maximising the value of the company, particularly for rising companies, in order to gain fast new prospects from exploitative actions.

According to Byoun (2011), the best capital structure from a static point of view cannot be "optimal" considering the interplay between today's financial actions and future financial alternatives. Financial flexibility seems to be a fundamental factor in determining the optimum capital structure. Financial flexibility is crucial but not driven by the pecking order theory (Brounen, Jong, & Koedijk, 2006).

Financial flexibility and debt level have a negative relationship, according to authors Chen and Jiang (2001), Alipour, Mohammadi and Derakhshan (2015). The pecking order theory may explain a negative relationship between the two variables by stating that a highly flexible company with adequate internal resources to support its operations and the use of financial leverage would generally be smaller (Chen & Jiang, 2001).

Whereas Gamba and Triantis (2008) emphasise that financial flexibility relies not just on the direct costs of external funding, but also on corporate and personal tax rates and on the value of capital liquidation. Companies with high levels of financial flexibility should be valued at a higher price compared to companies with a lower degree of financial flexibility (Gamba & Triantis, 2008).

Risk

The amount of risk is stated to be one of the key factors of a company's capital structure (Kale, Noe, & Ramirez, 1991). The findings of studies conducted by Barton and Gordon (1988) and Esperança, Gama and Gulamhussen (2003) revealed a positive relationship between risk and debt rate. A positive relationship with short-term debt was found by (Thies & Klock, 1992). The authors, Prasad, Green and Murinde (2001), justify the existence of a positive relationship with short-term debt due to credit rationing, which limits the extent to which companies can borrow for the long term and thus use short-term debt.

On the other hand, Titman and Wessels (1988), Jordan, Lowe and Taylor (1998) discovered a negative relationship between risk and debt level. The trade-off theory foresees a negative correlation between these two variables, as by raising the risk of a company, the use of debt will be reduced, and tax profit will not be obtained (Titman & Wessels, 1988). Growing companies should avoid excessive leverage since a large amount of debt may raise the risk, and this risk might endanger the development of a company (Du & Dai, 2005). A negative relationship between risk and debt is also predicted from the perspective of the pecking order theory.

4. Research Methodology

The research object of this study is the number of 50 non-listed companies in Kosovo reporting to the Kosovo Council for Financial Reporting (KCFR). Companies included in the sample are private companies that have been categorised in the category of large companies that report to the Kosovo Financial Reporting Council under the framework of the Ministry of Finance. The data has been collected from the financial statements of 50 companies and provide information on total term debt, size of a company driven from natural logarithm of total assets, liquidity calculated from current assets divided by current liability, profitability calculated from earnings before interest and tax divided by total assets, assets structure determined by fix assets divided by total assets, growth resulted from sales divided by total assets, effective tax rate driven from tax divided by earnings before taxes, financial flexibility calculated based on retained earnings divided by total assets, risk estimated from standard deviation divided by total assets. The sample comprises panel data covering the period of 2013-2018. Considering that the sample offers information across organisations and across time, a panel data approach, with respective fixed and random effects models, was utilised. According to Greene (2002) in the Fixed Effects Model (FF) *αi* is correlated with *x*. In this model, individual effects of a company or differences across individuals can be estimated by shifts in the regression equation as in Equation 1.

$$y = Xb + d\alpha + e \tag{1}$$

where, *d* is a vector of variables for each individual or unit effect.

In the Random Effects Model (RE) *αi* is uncorrelated with *x*. In this model individual effects are randomly distributed across companies (see Equation 2).

$$y_{it} = b\ x_{it} + \alpha_i + u_{it} \tag{2}$$

The RE model is a distinct case of the general mixed model with a random intercept α_i.

In order to be able to determine which of the estimated models is more appropriate, the Hausman test was performed and based on the value of this test, the decision to accept or reject the null hypothesis has been made. If the p-value of this test is smaller than 0.05 the alternative hypothesis was accepted (H1: Fitted FE model).

Empirical model

Specification of "fixed effect" model:

$$TD_{it} = \beta_{1i} + \beta_2 SIZE_{2it} + \beta_3 LIQ_{3it} + \beta_4 PROF_{4it} + \beta_5 AS_{5it} + \beta_6 GROW_{6it} + \beta_7 ETR_{7it} + \beta_8 FLEX_{8it} + \beta_9 RISK_{9it} + u_{it} \tag{3}$$

Specification of "random effects" model:

$$\beta_{1i} = \beta_1 + \varepsilon_i \tag{4}$$

Substitution:

$$TD_{it} = \beta_1 + \beta_2 SIZE_{2it} + \beta_3 LIQ_{3it} + \beta_4 PROF_{4it} + \beta_5 AS_{5it} + \beta_6 GROW_{6it} + \beta_7 ETR_{7it} + \beta_8 FLEX_{8it} + \beta_9 RISK_{9it} + \varepsilon_i + u_{it} \tag{5}$$

$$=TD_{it} = \beta_1 + \beta_2 SIZE_{2it} + \beta_3 LIQ_{3it} + \beta_4 PROF_{4it} + \beta_5 AS_{5it} + \beta_6 GROW_{6it} + \beta_7 ETR_{7it} + \beta_8 FLEX_{8it} + \beta_9 RISK_{9it} + \omega_{it} \tag{6}$$

$$\text{Where: } \omega_{it} = \varepsilon_i + u_{it} \tag{7}$$

5. Results and Discussion

The data in the following table contains statistics used to characterise the basic features of the variables for the 50 companies involved in the research. The mean and standard deviation provide information about the central tendency of distribution and the dispersion of the sample and the measures.

Table 1. Descriptive statistics of variables measuring the structure of capital, 2013-2018

Variable	Mean	Median	SD	Minimum	Maximum
TD	0.502263	0.503085	0.293505	0.050269	1.554488
SIZE	6.783611	6.807386	0.338699	5.873720	7.574298
LIQ	1.815767	1.818416	1.121459	0.000000	5.504970
PROF	0.090892	0.070368	0.080807	0.001000	0.374954
AS	0.401756	0.389509	0.270647	0.000000	0.985785
GROW	1.562606	1.534502	1.008450	0.020471	4.536772
ETR	0.104911	0.100000	0.208843	0.000000	3.186604
FLEX	0.065077	0.049062	0.060853	0.001000	0.248651
RISK	0.584384	0.471717	0.474480	0.014978	3.438112

Note: TD-Total term debt; SIZE (Size of the company) = Natural logarithm of total assets; LIQ (Liquidity) = current assets divided by current liability; PROF (Profitability) = earnings before interest and tax (EBIT) divided by total assets; AS (Assets structure) = fix assets divided by total assets; GROW (Growth) = sales divided by total assets; ETR (Effective tax rate) = tax divided by earning before taxes (EBT); FLEX (Financial flexibility) = retained earnings divided by total assets; RISK = standard deviation (EBITDA) divided by total assets.

The table below represents an assessment of the strength of the relationship between the explanatory variables and the measured variables to determine if there is a statistically significant positive or statistically significant negative relationship between them.

Table 2. Correlation matrix of variables, 2013-2018

	TD	SIZE	LIQ	PROF	AS	GROW	ETR	FLEX
SIZE	0.154*							
LIQ	-0.464***	-0.247***						
PROF	-0.364***	-0.227***	0.224***					
AS	0.016	0.378***	-0.361***	-0.238***				
GROW	-0.046	-0.275***	0.129*	0.435***	-0.363***			
ETR	0.038	-0.009	-0.015	-0.017	-0.166**	-0.030		
FLEX	-0.398***	-0.218***	0.237***	0.829***	-0.261***	0.352***	-0.018	
RISK	-0.219***	-0.711***	0.212***	0.184**	-0.305***	0.242***	-0.053	0.236***

Note: TD-Total term debt; SIZE = Size of the company; LIQ = Liquidity; PROF = Profitability; AS = Assets structure; GROW = Growth; ETR = Effective tax rate; FLEX = Financial flexibility; RISK = Risk.
*$P<0.05$; **$P<0.01$; ***$P<0.001$.

In the pooled regression model, 300 observations were grouped, disregarding the space and time dimension nature of the data. The main drawback of this model is that it stacks observations for each company one on top of the other, and it does not distinguish between individuality that may exist among companies. In the fixed effects model, we take into account the individuality of each company and let the intercept vary for each company, assuming that the slope coefficients are constant across companies.

Table 3. Regression analysis of the capital structure

Dependent variable: TD			
Explanatory variables	Fixed effects	Random effects	Pooled OLS
Constant	1.5824*** (0.4479)	1.3436*** (0.4013)	1.2276* (0.4226)
SIZE	-0.1166 (0.075)	-0.0756 (0.0574)	-0.0381 (0.0594)
LIQ	-0.0638*** (0.0119)	-0.0776*** (0.0113)	-0.1178*** (0.0133)
PROF	-0.6059* (0.2679)	-0.6167* (0.2569)	-0.5323 (0.3154)
AS	-0.2170* (0.0846)	-0.2105** (0.0679)	-0.2689*** (0.0608)
GROW	0.0107 (0.0176)	0.0139 (0.0155)	0.0288 (0.0159)
ETR	0.0539 (0.0520)	0.0320 (0.0508)	-0.0329 (0.0667)
FLEX	-0.3412 (0.3479)	-0.5493 (0.3336)	-1.1531** (0.4073)
RISK	-0.0527 (0.0337)	-0.0612 (0.0326)	-0.1070* (0.0414)
R^2	0.76	0.24	0.38
Adjusted R^2	0.70	0.21	0.36

Note: TD – Total term debt; SIZE – Size of the company; LIQ – Liquidity; PROF – Profitability; AS – Assets structure; GROW – growth; ETR – Effective tax rate; FLEX – Financial flexibility; RISK = Risk.

Table 3 shows the results of the multiple regression of pooled OLS, fixed effects (FE) and random effects (RE) models. In all three models, the relationship between total debt ratio (TD) and company size (SIZE), liquidity (LIQ), profitability (PROF), assets structure (AS), growth (GROW), effective rate tax (ETR), financial flexibility (FLEX) and risk (RISK). The most appropriate model choice is based on the obtained score of the Hausman test (Table 4).

The coefficient for liquidity is negative and is demonstrated to be a statistically significant factor in determining TD. Two more variables that demonstrated negative relationships that were statistically significant with TD determinants were profitability, and assets structure. In addition, the size, financial flexibility, and risk demonstrated negative relationships with TD. The results of this model also showed that growth and the effective tax rate had a positive relationship in TD.

Table 4. Testing and selecting the model for TD

Hypothesis		The P value for the Hausman test	Best fitted model
H_0: Fitted RE model	H_1: Fitted FE model	0.0019	H_1: Fitted FE model

Note: RE – Random effects model, FE – Fixes effects model

From the relationship between the factors involved in this research and the capital structure, measured through the total debt ratio, it can be underlined that between the size of a company and capital structure, there is a negative relationship. A negative relationship between them should also end, as predicted by Pecking order theory, because large companies can use more internal resources as a funding source. The results of this research are consistent with the author's studies Barton and Gordon (1988), Kale, Noe, and Ramirez (1991). Whereas, authors Deloof and Overfelt (2008) emphasised that large companies use less debt in their capital structure because of their ability to finance through issuing shares rather than debt financing.

Between liquidity and capital structure, there is a statistically significant negative relationship, as liquid companies do not need external resources. The same relationship also influences the Pecking order theory. Even the researchers' findings indicate a negative relationship between them. Deesomsak, Krishna and Pescetto (2004), Alipour, Mohammadi and Derakhshan (2015) all find a negative relationship between them. According to Alipour, Mohammadi and Derakhshan (2015), liquid companies have fewer capital requirements from foreign sources.

Also, between profitability and capital structure, there is a statistically significant negative relationship. This is acceptable according to the pecking order theory, because companies prefer to use more internal resources. The same opinion is shared by (Tong & Green, 2005); (Chang, Chen, & Liao, 2014)

From the study findings, it can be observed that there is a statistically significant negative relationship between asset structure and capital structure. Since fixed assets are used as collateral by the companies to be financed by the bank, in case they fail to repay, the fixed assets are utilised to repay debt. A negative relationship between them is also suggested by the Pecking order theory.

On the other hand, there is a positive relationship between growth and capital structure. Céspedes, González and Molina (2010), as well as Chang, Chen and Liao (2014), find a positive relationship between growth and debt rate. Because fast-growing companies must finance their projects, which is mostly accomplished by borrowing

From the results of the data, it can be shown that between the effective tax rate and the capital structure, there is a positive relationship. A positive relationship between the two factors is expected by (Haugen & Senbet, 1986). However, greater company tax rates would result in lower domestic revenues and higher capital expenditures.

There is a negative relationship between financial flexibility and capital structure. As a more flexible company, it needs less external financing. A negative relationship between them is also predicted by the pecking order theory, as a highly flexible company has adequate internal funds to pay for its activities. Even the researchers' results, Chen and Jiang (2001), Alipour, Mohammadi, and Derakhshan (2015), are compatible with the outcomes of our research.

Even between risk and capital structure, there is a negative relationship. Similar results may also be found in the research of Titman and Wessels (1988), Jordan, Lowe and Taylor (1998). Also, according to the perspective of trade-off theory, it might be seen as a negative relationship. From Titman and Wessels (1988) perspective, this negative relationship explains the fact that, by expanding usage of it, company risk debt will be lower and tax advantages will not be realised. A similar negative relationship is also anticipated by the Pecking order theory.

6. Conclusions

The study examines the determinants of the capital structure of non-listed companies in Kosovo, reporting to the Kosovo Council for Financial Reporting (KCFR). Using data extracted from 50 companies during 2013–2018, a series of panel econometric models were estimated. The determining factors of the capital structure involved in this research are: company size, liquidity, profitability, assets structure, growth, effective tax rates, financial flexibility, and company risk. The ratio of total debt is used to measure the capital structure.

The data is presented by the results of multiple regression models 'pooled OLS', 'fixed effects (FE)' and 'random effects (RE)'. From the results obtained through the Hausman test, it has come out as the most appropriate model.

From the findings, we can show that between the size of a company and its capital structure, there is a negative relationship. There is a statistically significant negative relationship between liquidity and capital structure as well. The statistically significant negative relationship is also between profitability, assets structure and capital structure. Whereas among growth, tax rate, and capital structure, there is a positive relationship. While between financial flexibility, risk, and capital structure is a negative relationship.

The negative relationship between the size of a company, liquidity, profitability, assets structure, financial flexibility, risk, and capital structure affects the management of the company when making borrowing choices. Our findings show that companies follow a

hierarchy of funding sources based on the Pecking Order theory model. So, from these results, it can be understood that companies aim to achieve optimal leverage based on the model of trade-off theory. But from the results of this research, it is not clear which of the two models best describes the financial behaviour of the companies. Also, the study's findings demonstrated the significance of capital structure in determining a company's financial resources in Kosovo. Decisions on a company's financial structure are critical to its survival.

The study offers various implications for policymakers and banks aiming at improving the financing of companies in Kosovo. Loans continue to be the major source of funding for companies in Kosovo, despite high-interest rates, underlining the need for the Central Bank of Kosovo to cooperate closely with commercial banks to lower interest rates. One solution may be to decrease the capital reserves required for commercial banks, given the relatively stable financial sector.

In order for companies to have greater prospects for growth, banks should improve lending procedures and apply more appropriate interest rates to companies. It's essential to have greater collaboration between companies, as when requesting loans, commercial banks need a guarantee from another company so they may back each other up and, in this form, have easier access to loans. Due to the financial limits and lack of proper financing tools, and to ensure that companies do not rely primarily on bank loans, the operation of the capital market in Kosovo should begin.

The construction of stock exchange activity in Kosovo is more than a necessity since the companies would enable the creation of new sources of finance via the issue of shares and bonds. The most favourable method of financing companies would accelerate their development and boost their competitiveness in the local and international markets. Such a role would have an influence on raising the quality of local products and services as well as on revenue growth. This would also have an influence on boosting the possibilities of creating sources of funding.

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ANALYSIS OF THE EFFECTIVENESS OF BUDGET DEFICIT FINANCING METHODS IN CÔTE D'IVOIRE USING A CREDIT SCORING MODEL[3]

After reaching the completion point of the Heavily Indebted Poor Countries (HIPC) initiative and the subsequent debt relief, Côte d'Ivoire decided to take the necessary measures to avoid a new public debt crisis. Ten years later, the country is at a crossroads with a rapidly growing debt. Given this situation, it is important to question the effectiveness of the methods of financing the budget deficit in Côte d'Ivoire. This article aims to develop a credit scoring model in order to analyse the efficiency of budget deficit financing modes using a sample of 3222 loan lines from the database of the Department of Public Debt and Grants of Ivory Coast. The results show that loans from bilateral and commercial banks can be considered as "risky" financing. This mode of financing has a less important impact on the probability of default. On the other hand, the results obtained with the estimation of the Logit model show that the probability of default is strongly reduced when the government is financed by bondholders and other debt instruments and multilateral institutions.
Keywords: Public debt; budget deficit; credit scoring; logistic regression; probability of default
JEL: H63; C25

Introduction

In the context of the reorganisation of public debt management, the issue of risk assessment is of renewed interest in the light of previous crises. After reaching the completion point of the Heavily Indebted Poor Countries (HIPC) Initiative, new public debt management tools were developed under an economic and financial programme with the IMF to avoid a high risk of debt distress. These include the Debt Sustainability Framework (DSF) developed by the International Monetary Fund (IMF), in which the Debt Sustainability Analysis (DSA) and the Medium Term Debt Management Strategy (MTDS) are arguably central.

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Thus, the economic literature offers several methods for analysing the sustainability of public debt. These have been used at some point as a warning tool for a country's debt trajectory. However, following the dynamics of re-indebtedness observed in certain emerging countries, notably in Côte d'Ivoire, it seems appropriate to study alternative methods of monitoring debt strategies. Indeed, the external debt of the Republic of Côte d'Ivoire rose from CFAF 971,7 billion in 1980 (45.2% of GDP) to CFAF 12381,0 billion in 1994 (268.2% of GDP) and then to CFAF 5748,6 billion in 2010 (46.6% of GDP).

Thus, CFAF 4090,02 billion were cancelled out of a stock of CFAF 6373,9 billion, i.e. a cancellation rate of 64.2%. This left a residual stock of CFAF 2283,9 billion.[4] Under this initiative, all resources resulting from HIPC debt relief have been directed to the poor. Hence, priority was given to basic social spending (education, health and other social areas essential for development). The HIPC initiative has given greater responsibility to recipient countries in the face of a new debt overhang crisis that may occur in the coming years. The cancellation of the entire debt stock is a way to reduce the burden of the past on future debt dynamics.

Thus, for Côte d'Ivoire, whose financing needs remain high, the important question is the nature of the financing to be sought in the future. It should be noted that after reaching the completion point of the HIPC Initiative and the subsequent debt relief, Côte d'Ivoire resorted to methods of mobilising resources on the financial markets to finance the National Development Plan (NDP). Thus, the total outstanding public debt portfolio, from 2012-2020, recorded strong growth from CFAF 4679,6 billion in 2012 to CFAF 16802,3 billion in 2020, with the debt/GDP ratio rising from 33.9% GDP in 2012 to 47.8% GDP in 2020.

In addition, debt service rose from 391,3 billion in 2012 to 1769,3 billion in 2019, an increase of 1378,0 billion CFA francs in seven years. In 2020, debt servicing will amount to CFAF 1926,2 billion (nearly 25% of the budget), up by 20% compared to the previous year's figures.[5] This evolution of the stock of public debt and its servicing[6] is likely to lead to difficulties that could weigh on the sustainability of public finances and lead, in the context of the elimination of direct monetary financing by the Central Bank, to a significant increase in taxes or a default on the debt. The burden of this debt has become such that the country devotes a large part of its budget to debt service payments. All too often, the repayment of this debt takes precedence over the vital needs of the population and mortgages all development prospects. As a result, the issue of public debt has come to the forefront more than ever. These are the reasons for this article.

In view of the increasing evolution of public debt, it is important to propose innovative tools to assess the performance of debt instruments. In this respect, credit scoring would be a way to avoid a high risk of debt distress because of its ability to predict the probability of default. Innovations in the application of credit scoring to a sovereign and the analysis of default can help to compare the performance of debt instruments and to determine the preferred financing to meet the financing need.

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[4] Department of Public Debt and Grants (DDPD).
[5] Department of Public Debt and Grants (DDPD).
[6] Secretary of State to the Prime Minister, in charge of the Budget and the State Portfolio of Côte d'Ivoire (Communication to the Council of Ministers).

Therefore, the general objective of this article is to empirically analyse the modes of financing the budget deficit that can explain or justify the probability of default. With regard to our general objective, we formulate the following specific objectives:

- To show that certain financing methods are likely to lead to a default on public debt;

- To demonstrate that there are financing methods that are less likely to result in debt default;

- To prove that there are less "risky" modes of financing to be favoured in the context of budget deficit financing in Côte d'Ivoire.

This paper is divided into five sections. Section 1 provides an overview of credit scoring. Section 2 is devoted to the literature review on credit scoring. Sections 3 and 4 deal with the methodology and empirical results, respectively. Finally, section 5 explains the construction of the credit scoring model and analyses the results.

1. General View on Credit Scoring

Credit scoring is a statistical forecasting method that aims at associating to each credit application a score proportional to the borrower's probability.[7] It is the action of assessing the risk of default of a credit beneficiary on the basis of elements. This technique makes it possible to simplify the examination of credit files.

In the same sense, Flamam (1997) refers to scoring as a process of assigning a rating (or score) to a potential borrower to estimate the future performance of his loan.

For Caire and Kossmam (2003), this method uses quantitative measures of performance and characteristics of previous loans to predict the performance of future loans with similar characteristics. It neither approves nor rejects a loan application; rather, it can predict the probability of occurrence of poor performance (default) as defined by the lender.

Thomas et al. (2002) consider this technique as a set of decision models and underlying techniques that help in the decision to grant consumer credit.

Indeed, score models are risk measurement tools that use historical data and statistical techniques. Their purpose is to determine the effects of various borrower characteristics on their chance of default. They produce scores which are ratings that measure the default risk of potential or actual borrowers. Financial institutions can use these scores to classify borrowers into risk categories.[8]

Thus, the objective of scoring is to assess the financial situation of a company in a synthetic way and to classify it in the category of viable or defaulting companies.

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[7] Percie Du Sert, A. M. (1999). Risk and credit control. economica edition, Paris, p. 36.
[8] Dietch, M., Petey, J. (2003). Mesure et gestion du risque de crédit dans les institutions financières. ed. Revue banque éditeur, Paris, p. 48.

To sum up, it can be concluded that credit scoring is a risk management tool that aims at predicting the probability of default of a new loan using previous loans. Thus, the purpose of credit scoring is to predict risk, not to explain it.

2. Theoretical Framework of Credit Scoring

There are several techniques for the construction of scoring models. Indeed, the implementation of a unidimensional approach, illustrated by the study of W. BREAVER in 1966, is considered as a first effort in the application of the statistical method.[9] This classification method is based on a single ratio.

The objective is to classify companies into one of two groups: defaulting or non-defaulting, on the basis of the most discriminating ratio. Beaver proceeded as follows: he ranked the companies according to the values taken by each ratio. Then he chose a critical threshold so that any firm with a ratio below this threshold is considered to be failing and any firm with a higher ratio is considered to be doing well. The critical threshold is determined in such a way as to maximise the good rating rate. It is this rate that will determine the most discriminating ratio.

Altman's (1968) research is the benchmark in the field of bankruptcy prediction. Altman's model was constructed using the discriminant analysis method and aimed to determine the algebraic equation that, using financial ratios, would best discriminate between failing and healthy firms. To construct his model, Altman used a sample of sixty-six firms, half of which were healthy and half bankrupt.

In 1991, Véronnault and Legault presented a model called the CA Score, similar to Altman's but based on more recent data. The sample was made up of Quebec manufacturing companies that had been in existence for more than five years and had sales of between 1 and 20 million dollars.

In addition, Conan and Holder have developed a model whose score allows a ranking of the most risky companies.

This model is implemented through five (05) phases, namely:

Stage 1: Definition of a study sample

Stage 2: Establishment of indicators to explain the bankruptcy

Stage 4: Assessment of the predictive quality of the indicators

Stage 5: Application of the method

This model uses five (05) variables which are weighted against each other according to their relative importance.

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[9] Cohen, E. (1990). Analyse financière. édition économico, Paris, p. 502.

3. Methodology

This section aims to present the different stages of the scoring method in the context of budget deficit financing in Côte d'Ivoire. Two statistical techniques were used to develop the model: discriminant analysis and logistic regression. We used STATA[10] software to implement the above-mentioned statistical techniques.

Discriminant analysis is a statistical tool that can be used for descriptive and classification purposes to analyse a variety of situations in different fields, such as finance and marketing. It is used to model the value of a qualitative dependent variable and its relationship with one or more explanatory variables. Given a set of independent variables, the discriminant analysis attempts to find linear combinations of these variables that allow different groups of cases to be distinguished. These combinations are called discriminant functions.

The implementation of discriminant analysis is based on certain key assumptions :

* The explanatory variables are not highly correlated with each other;

* The average and variance of a given explanatory variable are not correlated;

* The explanatory variables are normally distributed;

* The correlation between two given explanatory variables is constant within the group (the variance-covariance matrix is homogeneous).

As some of the assumptions required for the application of discriminant analysis were not satisfied (notably that of the normality of the explanatory variables), we decided to use logistic regression, which accepts a wider range of distributions. Unlike discriminant analysis, logistic regression uses the Maximum Likelihood approach to estimate the model parameters. The error term is assumed to follow a logistic distribution.

The main objective of this research is to develop a statistical model that can distinguish between "good" and "risky" financing arrangements (with a high probability of default). The first step is, therefore, to define what we mean by "good" and "risky" financing methods.

A financing method is considered "good" if it is properly reimbursed and has not been overdue for thirty (30) days or more.

The current version of Stata incorporates a package and kernel update tool that allows regular updating and integration of new packages during its development. Packages published in the Stata Journal are often integrated between two versions of Stata. On the other hand, a

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[10] Stata is a statistical software package created by William W. Gould. The first official version of Stata – originally available only on the PC – was released in January 1985, with the project having started only a year earlier. In 1993 he founded StataCorp, which develops the Stata software and manages related services such as training, technical support, publishing, annual user meetings, and of which he is still president. The current version of Stata incorporates a package and kernel update tool that allows regular updating and integration of new packages during its development. Packages published in the Stata Journal are often integrated between two versions of Stata.

financing mode is considered "risky" if it has at least once been late in repayment for thirty (30) days or more.

It should be mentioned that these definitions are the result of discussions with the staff of the Debt Repayment Branch. The presentation of the database requires the determination of a few essential elements, including:

- The target population;

- The default criterion;

- The sampling method;

- The variables.

In the course of data collection, we targeted the different ways of financing the budget deficit. For these different debt mobilisation instruments, we mainly used the Debt Management and Analysis System (DMFAS) to collect data on government credit lines, as well as other types of macroeconomic data from the database of the Department of the Economy (DGE).

We also had recourse to the branch of public debt reimbursement and grants to have more information on certain credit lines, on the causes of default and also in order to identify the variables linked to default.

In order to define the default criterion, we have accepted that the most important thing for a sovereign is not its ability to mobilise resources in the financial markets but its ability to meet its commitments, i.e. its claims.

To carry out this reallocation of our database, we have chosen as a criterion for default – the postponement of repayment of a debt by a given deadline.

This is the deferral of all or part of one or more debt service payments on one or more loans. The concept can be understood as the outcome of debt restructuring negotiations.

In other words, it can refer to a reorganisation operation that is undertaken jointly by a creditor and a debtor and that results in a change in the debt service profile with a view to alleviating the debt burden. This may involve the provision of a loan for debt restructuring or grants for debt relief. In the latter case, it may be undertaken unilaterally by the creditor. Debt restructuring includes debt forgiveness, debt rescheduling[11], debt refinancing[12] and debt conversion.[13] The database consists of 3223 credit lines. This distribution is based on

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[11] Debt rescheduling can be defined as an official postponement of debt service payments with the application of new maturities to the postponed amounts. The maturities affected by rescheduling are those of the consolidation period, usually one to three years. This means that the discussions only cover the debt service falling due during this period.

[12] By refinancing, we mean the use of a new loan that either replaces the original loan or covers all or part of the payments due on the original loan.

[13] By conversion of debt, we mean any transaction that exchanges debt for either an asset or another debt. In the first case, the conversion can take the form of a debt-for-natural-resource investment swap, a purchase of debt at a lower price than the nominal value for reinvestment in the debtor country (transformation of an interest-bearing debt into a clean title), and in the second case it is a conversion of a debt, usually short-term, into another form of debt, most often a long-term bond issue.

qualitative variables. Furthermore, the results of the descriptive statistics indicate that, on average, defaulted loans have a maturity of (16.65) years, which is higher than the non-defaulted lines of credit by (9.74) years.

As for the interest rates, we obtain an average of 5.20% for the defaulting credit lines. While, the non-defaulted loans have an average interest rate of 3.96%.

Finally, the amounts of loans that defaulted are smaller than those that did not default.

Table 1. Distribution of sample according to the probability of default on payment

Failure to reimburse	Freq.	Percent
0	2 787	86.47
1	436	13.53
Total	3 223	100.00

Source: Author based on data from the Department of Public Debt and Grants.

In addition, this database includes the qualitative variable "non-payment" which includes the value "1" if the loan defaults and "0" otherwise.

Figure 1. Lines of credit according to the probability of default on payment
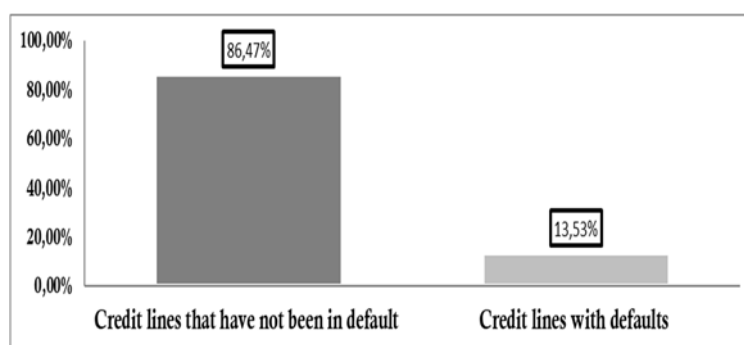
Source: Author based on data from the Department of Public Debt and Grants

This chart shows that in our database (86.47%) of the credit lines did not default, while (13.53%) did default. Thus, our database is composed of two subsets: (38.07%) debt from external sources and debt from domestic sources (61.93%).

Table 2. Distribution of samples according to the source of debt

SOURCE OF DEBT	Freq.	Percent
EXTERNAL	1 227	38.07
INTERNAL	1 996	61.93
TOTAL	3 223	100.00

Source: Author based on data from the Department of Public Debt and Grants.

Figure 2. Assignment of lines of credit according to the source of debt
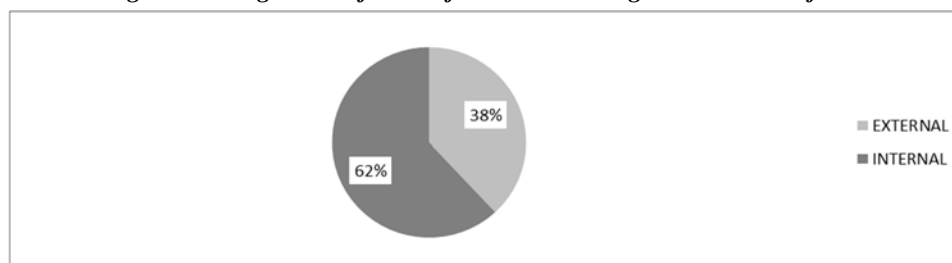
Source: Author based on data from the Department of Public Debt and Grants.

The following table provides the distribution of the database by type of creditor:

Table 3. Distribution of samples by type of creditors

Type_Creditor	Freq.	Percent
Monetary Authority	7	0.22
Commercial Bank	162	5.03
Bilateral	708	21.97
Public Financial Institution	80	2.48
Public Non-Financial Institution	23	0.71
Multilateral	477	14.8
Holders Of Bonds And Other Securities	1 766	54.79
Total	3 223	100.00

Source: Author based on data from the Department of Public Debt and Grants.

Figure 3. Assignment of lines of credit according to the types of creditors

Source: Author based on data from the Department of Public Debt and Grants.

Holders of bonds and other debt instruments are the types of creditors most sought after by the State to meet its financing needs. Thus, about 1/2 (54.79%) of the database is made up of bondholders and other debt holders compared to (21.97%) for bilateral loans.

Then, according to the database (14.8%) come from multilaterals, (5.03%) from commercial banks, (2.48%) from public financial institutions. The rest of the database 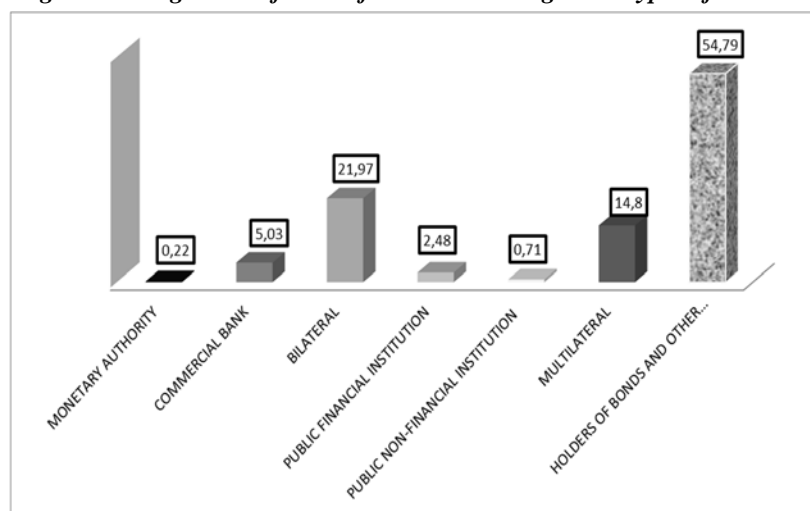is not sufficiently representative, notably non-public financial institutions (0.71%) and the monetary authority (0.22%).

Based on the theoretical framework developed and the availability of data, we identified and collected information on 3223 credit lines. The phenomenon we want to test is the possibility for a government to fulfil its commitments on the due date. In other words, we will try to determine the variables that have an influence on the probability of default.

We thus associate to the dichotomous dependent variable the ability of a country to meet its claims or not:

- Probability (Y = 1) if the government is in default ;

- Probability (Y = 0) if otherwise.

In order to determine whether the country has defaulted on its debt, we have based ourselves on a survey of the Department of Public Debt and Grants, notably the branch in charge of debt repayment, on each of the credit lines in our database. In the event that no defaults were observed, we consider that debt reimbursement had occurred. Our dependent variable will therefore be the dichotomous variable <<non-payment versus not defaulting>>. We assume that a government's decision to default on its debt is influenced by a number of variables.

Independent variables: choices and theoretical justifications

We selected eighteen (18) explanatory variables as indicators of a debtor country's financial and economic health and its ability to support its debt. The selection of variables is based on the consideration of the borrowing country's ability to repay its debt in the short and long term, but also a number of factors that could divert resources from debt payments. The choice of the latter was also dictated by the availability of data.

The definition of the different variables is derived from previous studies on the subject (Lemarbre, directed studies, 1992; Odedokun, 1995; IMF, 1998; Berhanu, directed studies, 2000; etc.).

The source of the debt

The source of debt can be a factor of vulnerability in meeting a government's commitments. Many developing countries, due to the lack of development of their domestic government securities market, often resort to the international financial market.

Consequently, a government that takes on foreign currency debt is exposed to foreign exchange risk. In other words, a change in the currency exchange rate can lead to an increase

in debt service by compromising its ability to service its debt. One would expect to have a positive coefficient if the source of the debt is external.

Types of creditors

Public indebtedness to official creditors can have an impact on the repayment capacity of a country. This is because each type of creditor defines the terms and conditions under which a loan can be obtained. Before funds can be released, the borrowing country enters into a loan agreement with the relevant lender. Thus, the clauses of this loan agreement act as a constraint for the borrowing country to fulfil its commitments. Under these conditions, the possibility of defaulting is low because the debtor country is exposed to no longer having access to the financial market. We should therefore expect the coefficients for these different variables to be negative.

Maturity

This indicator indicates the duration of a loan. For developing countries, a long maturity seems to be associated with a probability of default. Thus, a positive coefficient should be expected.

The interest rate and the exchange rate

These two factors (02) have an impact on the amounts of credit granted, which can be brutal when there is a shift in expectations. Indeed, these two elements played a central role in the 1982 debt crisis that hit Latin American countries. For low-income countries, however, these two factors play only a minor role, as their external financing is public. Also, interest rates are often very low and vary very little. Thus, these two variables should have positive coefficients.

Loan amount

The loan amount granted to a debtor country could have an impact on default. A State that mobilises large amounts of money to finance its budget deficit may be exposed to default on these amounts. The loan amount variable is an element of the possibility of default. Therefore, the coefficient of this factor is expected to be positive.

The rate of private investment

This factor helps to stimulate economic growth. An increase in investment helps to increase the productive capacity (output) of the country. Thus, as long as the growth rate of production is higher than the interest rate to be paid on the debt, the government has no difficulty in obtaining loans and, therefore, in repaying its debt.

On the other hand, if the growth rate is lower than the interest rate, there will be a negative capital inflow to the debtor country. This negative capital transfer will increase the probability of the country defaulting. This variable should have a negative coefficient (Soma, 1991; Berhanu, directed studies, 2000).

Rate of public investment

This ratio indicates the good economic health of the country and serves as a measure of the level of development of the indebted country.

The higher the ratio, the better the prospects for economic growth. Thus, the country will have a high probability of repaying its debt (Lemarbre, directed work, 1992; Odedokun, 1995; Berhanu, directed work, 2000). The coefficient on this variable is expected to be negative.

Debt service as a percentage of exports of goods and services

This ratio compares debt service, which represents a regularly recurring outflow of foreign exchange, to exports, which constitute the main inflow of foreign exchange. Thus, the larger the share of foreign exchange inflows that is consumed by debt service, the greater the risk that the country will not be able to adequately service its debt (Moghadam and Samavati, 1991; Lemarbre, directed study, 1992; Odedokun, 1995; IMF, 1998). The coefficient on this variable can therefore be expected to be positive.

Primary balance as a percentage of GDP

This variable measures the government's ability to finance debt servicing from a fiscal point of view. The more positive this ratio is, the more the government has sufficient resources to ensure the proper running of the economy and meet its commitments. This variable should have a negative coefficient.

External debt as a percentage of GDP

This factor measures a country's level of external indebtedness. The higher the ratio, the higher the vulnerability of the country to production problems. The coefficient of this variable is expected to be positive (Moghadam and Samavati, 1991; Lemarbre, directed study, 1992; Odedokun, 1995; IMF, 1998).

In Table 4 some key variables are defined.

Table 4. Definition of variables

Variables	Definition
Source of the debt	
SE	external source
SI	internal source
Types of creditors	monetary authority
X1	monetary authority
X2	commercial bank or other financial inst. financial
X3	bilateral
X4	public financial institution
X5	public non-financial institution
X6	multilateral
X7	holders of bonds and other debt securities
Other variables	
X8	maturity
X9	interest rate
X10	loan amount
X11	currency devaluation
X12	private investment rates
X13	rate of public investment
X14	debt service as a percentage of exports of goods and services
X15	primary balance as a percentage of GDP
X16	external debt as a percentage of GDP

Source: Author.

4. Empirical Results

The analysis of the relationship between non-repayment and some qualitative characteristics of the financing arrangements was carried out using cross-tabulations and related statistics (chi-square, contingency coefficients etc.).

Default and source of public debt

The Chi-square test indicates a possible relationship between default and debt source.

Table 5. Source of debt and default on payment

Default of payment	Source of debt		Total
	External	Internal	
0	825	1 962	2 787
1	402	34	436
Total	1 227	1 996	3 223

Source: Author based on data from the Department of Public Debt and Grants.

Pearson chi2(1) = 626.6556 Pr = 0.000

Thus, among the lines of credit that have not been subject to default, (29.60%) are from external sources, while 70.40% are from internal sources. Of the defaulted loans, (92.2%) are from external sources, while (7.8%) are from domestic sources.

Table 6. Source of debt and probability of default on payment

Default of payment	Source of debt		Total
	External	Internal	
0	825	1 962	2 787
	29,60	70,40	100
1	402	34	436
	92,2	7,8	100
Total	1 227	1 996	3 223
	38,07	61,93	100

Source: Author based on data from the Department of Public Debt and Grants.

Of the credit lines contracted in foreign currency (67.24%) were not subject to default, while those contracted in local currency, 98.30% were not subject to default.

Similarly, of the credit lines contracted in foreign currency (32.76%) were in default, while only 1.7% of the loans in local currency were in default.

Table 7. Source of debt and probability of default payment

Default of payment	Source of debt		Total
	External	Internal	
0	825	1 962	2 787
	67,24	98,30	86,47
1	402	34	436
	32,76	1,7	13,53
Total	1 227	1 996	3 223
	100	100	100

Source: Author based on data from the Department of Public Debt and Grants.

Thus, about (38.07%) of the database is from external sources. However, the majority of the credit lines are from internal sources (61.92%). In this category (13.52%) of the loans were in default against (86.47%) that were not in default.

Finally, in view of the above results, the external source of debt seems to be associated with a higher risk of default. This is a relatively normal situation given that the country generally practices what is called "original default" (Eichengreen et al., 2005).

In other words, since the country does not have a sufficiently developed domestic financial system and since their domestic currency cannot be used to borrow on the international market, they need to take on foreign currency debt and turn to foreign creditors for financing. Overall, the significance of the Chi-squared test allows this link to be established.

Default and types of creditors

After examining the independence between default and types of creditors, by the Chi-square test, which relies on two assumptions which are:

- H0: independence between default and types of creditors;

- H1: dependence between the two.

The Chi-square test shows the following results for the independence test (default - creditor types):

Table 8. Types of creditors and default on payment

Default of payment	X1	X2	X3	X4	X5	X6	X7	Total
0	3	147	318	75	21	476	1 747	2 787
1	4	15	390	5	2	1	19	436
Total	7	162	708	80	23	477	1 766	3 223

Source: Author based on data from the Department of Public Debt and Grants.

Pearson chi2(6) = 1.4e+03 Pr = 0.000

From this test, we find that default and creditor types are dependent. So the type of creditors has an impact on default. The State of Côte d'Ivoire mobilised about (89.45%) of its financing needs, despite its default rate, which is in the first place, followed by (4.36%) bondholders and other types of borrowing, (3.44%) commercial loans and (1.15%) public financial institutions, and finally (0.92%) the Monetary Authority, (0.46%) non-public financial institutions and (0.23%) lines of credit from multilaterals.

For the latter category, the results indicate that of the non-defaulted credit lines, about (17.08%) are from multilateral loans. This can be explained in part by the constraints and guarantees of international financial institutions prior to the full repayment of their loans.

On the other hand, (63%) of the cases of non-defaulted loans are due to credit lines with bondholders and other debt securities, (11.41%) are bilateral loans, (5.27%) are commercial loans, (2.69%) loans with public financial institutions, (0.75%) are non-public financial institutions.

Finally, in this same category, about (0.11%) comes from the monetary authority. In this sense, this result could be explained by the fact that seigniorage is a cheap source of financing for the State (Burda and Wyplosz, 2009).

The Treasury's loans from the Central Bank are generally contracted at very low or even zero rates. Thus, Hetzel (1997) points out that seigniorage is considered by some politicians as free financial resources.

Table 9. Types of creditors and probability of default on payment

Default of payment	X1	X2	X3	X4	X5	X6	X7	Total
0	3	147	318	75	21	476	1 747	2 787
	0,11	5,27	11,41	2,69	0,75	17,08	63	100
1	4	15	390	5	2	1	19	436
	0,92	3,44	89,45	1,15	0,46	0,23	4,36	100
Total	7	162	708	80	23	477	1 766	3 223
	0,22	5,03	21,97	2,48	0,71	14,8	55	100

Source: Author based on data from the Department of Public Debt and Grants.

Moreover, of the loans contracted with multilaterals, (99.79%) have not been subject to default. Indeed, for international financial institutions, the states requesting their intervention are also required to comply with budgetary discipline criteria. In this case, the IMF recommends that the public debt ratios of borrowing states should not exceed alert thresholds defined in the economic and financial programmes. Similarly, of the bondholders' credit lines, (98.9%) had no reimbursement problems.

In this category, loans committed to public financial institutions represent (93.30%), compared to (91.30%) for those contracted at non-public financial institutions, (90.74%) for lines of credit at commercial companies and (42.86%) for monetary authority. In the same vein, loans from the Central Bank and bilaterals had reimbursement difficulties of (57.4%) and (55.08%) respectively.

Table 10. Type of creditors and probability of default on payment

Default of payment	X1	X2	X3	X4	X5	X6	X7	Total
0	3	147	318	75	21	476	1 747	2 787
	42,86	90,74	44,92	93,75	91,30	99,79	98,9	86,47
1	4	15	390	5	2	1	19	436
	57,14	9,26	55,08	6,25	8,7	0,21	1,08	13,53
Total	7	162	708	80	23	477	1 766	3 223
	100	100	100	100	100	100	100	100

Source: Author based on data from the Department of Public Debt and Grants.

The analysis of the relationship between default and the type of creditor showed a strong link between these two variables. This result highlights that bilateral loans and seigniorage represent a higher risk of default than other types of creditors.

Indeed, for a state that is under-taxed or whose tax system is inefficient, that has to borrow at high-interest rates, or that does not have access to financial markets to finance itself, seigniorage may be a feasible financing option because of its ease of mobilisation and low cost.

Creditors usually consider the effectiveness and legitimacy of the policies that the government is putting in place before lending to it. They may consider that a government that chooses the easy way of monetary financing is a government that suffers from a crisis of illegitimacy or a crisis of incompetence.

Thus, they may feel that the government is not trustworthy, which leads them to reduce their refinancing offer and their credit offer to the government. The latter may then find itself unable to raise funds on the financial markets, which is certainly detrimental to the financial situation of the country.

Of all categories, domestic and multilateral debt appear to be associated with a low risk of default. The government can resort to issuing public treasury securities to meet its financing needs. Moreover, financial securities issued by the government are generally considered risk-free, which makes them very attractive to risk-averse lenders. The fact that government securities are considered low-risk investments (especially regarding default risk) should allow the government to benefit from both low-cost debt and higher competitiveness than other securities.

5. Construction of the Credit-Scoring Model and Analysis of the Results

For the establishment of the score function, the two most used statistical techniques are discriminant analysis and logistic regression; in the framework of the thesis, we opted for logistic regression since no ratio follows the Normal law, which favours the use of logistic analysis.

Unlike discriminant analysis, logistic regression uses the Maximum Likelihood approach to estimate the model parameters. In addition, the error term is assumed to follow a logistic distribution. Moreover, it allows the treatment of explanatory variables to be predicted with two values without making restrictive hypotheses. Parameters with positive coefficients influence the probability of default positively and those with negative coefficients affect it negatively.

In the equation, the source of debt, the types of creditors, the interest rate, the amount, the rate of public and private investment and the external debt/GDP reduce the probability of default when they increase.

On the contrary, maturity, currency depreciation, primary balance as a percentage of GDP and debt service as a percentage of exports of goods and services (SxP) have a positive relationship with the probability of default.

The results of the logistic regression provided by the STATA software have been listed in Table 11.

Table 11. Results of the logistic regression

Default of payment	Coeff.	Std. Err.	z	P>|z|		[95% conf. interval]
Source						
Internal	-2,5704	0,6874	-3,74	0,000	-3,9177	-1,2230
Type of creditor						
Commercial bank or other financial institutions	-4,7344	0,8843	-5,35	0,000	-6,4676	-3,0012
Bilateral	-3,9306	0,9808	-4,01	0,000	-5,8529	-2,0082
Public financial institutions	-3,6076	0,8464	-4,26	0,000	-5,2667	-1,9485
Public non-financial institutions	-2,7389	1,0748	-2,55	0,000	-4,8457	-0,6322
Multilateral	-10,4272	1,2140	-8,59	0,000	-12,8066	-8,0477
Bondholders and other debt holders	-3,2880	0,7016	-4,69	0,000	-4,6631	-1,9129
Maturity	0,0449	0,0051	8,72	0,000	0,0348	0,0550
Interest rates	-0,3063	0,0279	-10,94	0,000	-0,3612	-0,2514
Ln loan amount	-0,0578	0,0304	-1,9	0,000	-0,1176	0,0019
1.Currency devaluation	3,1666	0,5508	5,75	0,000	2,0869	4,2462
TIVP	-0,2267	0,0447	-5,07	0,000	-0,3144	-0,1390
TIVPU	-0,2390	0,0662	-3,61	0,000	-0,3689	-0,1091
SXP	-0,0815	0,0102	7,93	0,000	0,0613	0,1016
SPPIB	0,1924	0,0422	4,56	0,000	0,1097	0,2752
DEPIB	-0,0312	0,0035	-8,75	0,000	-0,0382	-0,0242
Constant	9,1749	1,2213	7,51	0,000	6,7810	11,5687

Source: Author based on data from the Department of Public Debt and Grants.
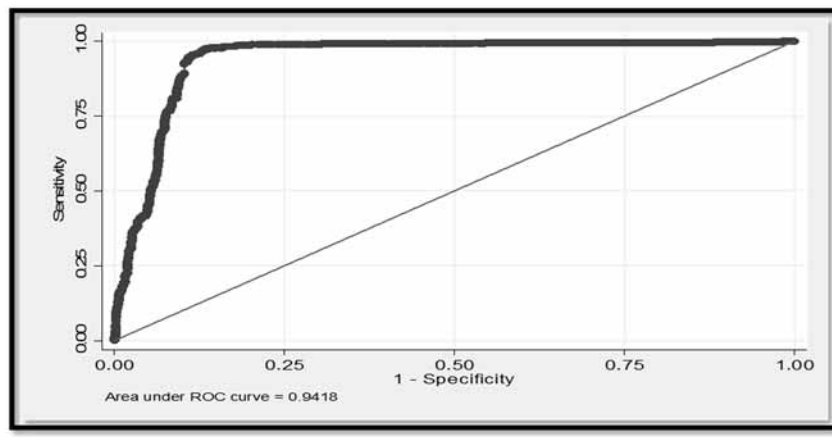

Taking **p** as the probability of default, the model estimation produces the following equation:

$$\log(\frac{\rho}{1-\rho}) = 9{,}17 - 2{,}57\,SI - 4{,}73\,X2 - 3{,}93\,X3 - 3{,}60\,X4 - 2{,}74\,X5 - 10{,}43\,X6 - 3{,}29\,X7$$

The probability of default p is then determined by the following equation:

$$\rho = \frac{1}{1 + e^{-9{,}17-2{,}57\,SI-4{,}73\,X2-3{,}93\,X3-3{,}60\,X4-2{,}74\,X5-10{,}43\,X6-3{,}29\,X7}}$$

Figure 4. Progress of the race ROC (Receiver Operating Characteristic)

Source: Author based on data from the Department of Public Debt and Grants.

When the ROC curve coincides with the diagonal, the score is better than a random model (where the class is assigned randomly). The closer the ROC curve is to the upper left corner, the better the model, as it captures as many true positives as possible with as few false positives as possible.

Consequently, the area under the curve represents the sensitivity of the model. In other words, the area under the ROC curve can be seen as a measure of the quality of the score. The criterion of the ROC curve varies between 0 (worst case) and 1 (best case). The value (1) indicates an ideal model and (0,5) – a random model. Thus, the logit model correctly predicts the probability of default in 94.18% of cases.

Using the logit regression method, we tested the relationship between the independent variables and the dependent variable, which represents the default or repayment of public debt. The sign (+) means that the variable has a positive impact on the probability of default and the sign (-) means that the variable reduces the probability of default.

Table 12 contains the results of the marginal effects of our estimates on the probability of default.

Table 12. Results of marginal effects on the probability of default

variable	dy/dx	Std. Err.	z	P>|z|	[95 % conf. interval]		X
_Isour~2*	-0,1567	0,0637	-2,46	0,014	-0,2815	-0,0318	0,6038
_Itype~3*	-0,0526	0,0073	-7,2	0,000	-0,06694	-0,0383	0,0506
_Itype~4*	-0,0937	0,0226	-4,14	0,000	-0,1381	-0,0493	0,2230
_Itype~7*	-0,0449	0,0063	-7,09	0,000	-0,0573	-0,0325	0,0262
_Itype~8*	-0,0400	0,0063	-6,31	0,000	-0,0525	-0,0276	0,0065
_Itype~9*	-0,1892	0,0249	-7,58	0,000	-0,2382	-0,1403	0,1597
_Ityp~10*	-0,1923	0,0655	-2,93	0,000	-0,3207	-0,0638	0,5306
maturity	0,0018	0,0002	6,34	0,000	0,0012	0,0023	11,2187
RATE_I~T	-0,0123	0,0017	-7,09	0,000	-0,0158	-0,0089	4,6229
lnMONT~T	-0,0023	0,0012	-1,86	0,000	-0,0048	0,00012	21,1782
_Idev_1*	0,4562	0,1367	3,34	0,000	0,1883	0,7242	0,0193
TVP	-0,0091	0,0020	-4,49	0,000	-0,0131	-0,0051	8,2347
TIVPU	-0,0096	0,0029	-3,32	0,000	-0,0153	-0,0039	4,5499
SXP	0,0032	0,0005	5,92	0,000	0,0022	0,0043	13,6731
SPPIB	0,0077	0,0018	4,11	0,000	0,0040	0,0115	-1,1264
DEPIB	-0,0012	0,0002	-6,14	0,000	-0,0016	-0,0008	63,0248

Source: Author based on data from the Department of Public Debt and Grants.

The marginal effects of our regression show the following results:

- When the source of funding for a loan is domestic, the probability of default is reduced by (15.67%) compared to funding from external sources. Sovereign defaults on external debt are far from rare;

- The probability of default is reduced by (5.26%) if the borrowing government mobilises resources from commercial banks and other financial institutions rather than the monetary authority. As a result, the probability of default is slightly reduced;

- When the government borrows from bilaterals, its probability of default is reduced by (9.37%) compared to the monetary authority;

- A borrower who mobilises financial resources from public and non-public financial institutions, the probability of default is reduced by (4.49%) and (4%), respectively, compared to the monetary authority;

- The model indicates that if the government borrows from multilateral institutions, then the probability of default is reduced by (18.92%). Thus, multilateral loans significantly reduce the probability of default compared to the monetary authority;

- A comparison of the marginal effects on default probabilities shows that credit lines to bondholders and other debt holders significantly reduce the probability of default compared to the monetary authority by (19.23%).

"Risky" financing methods

The results show that loans from bilaterals and commercial banks can be considered as "risky" financing. This mode of financing has a lower impact on the probability of default.

Indeed, bilateral claims normally take the form of loans from one sovereign State to another, often to finance exports from the creditor country or to provide development assistance. Generally, bilateral loans are made for non-profit purposes, but for public policy reasons, such as crisis response, official development assistance and trade development. One of the criticisms is that bilateral loans were given to increase the exports of the lending countries or to promote their geopolitical objectives.

Also, official bilateral creditors frequently restructure before or after default, both formally and informally, through new financing or restructuring of existing debt. Roubini and Setser (2004) find that private creditors generally face a higher risk of default and more pronounced restructurings than bilateral creditors.

In the same vein, Steinkamp and Westermann (2014) conducted a survey whose results show that there is a 65% probability that bilateral loans granted during the euro area crisis will be treated as senior claims.

Schlegl et al. (2017) find that Paris Club restructurings outnumber private creditor defaults and result in a larger haircut for official bilateral creditors. They find that sovereigns are more likely to run up arrears to official creditors than to private creditors.

Also, Rieffel (2003) and other economists have shown that "there is a general perception that bonds have priority over bank loans". This observation is supported by empirical evidence. Schlegl et al. (2017) found that bank loans were more likely than bonds to fall into arrears.

In general, rating agencies do not consider defaulting on debt to another government (e.g. S &P Global Ratings 2017; Fitch, 2018).

Less "risky" financing methods

The results obtained with the estimation of the Logit model show that the probability of default is strongly reduced when the government is financed by bondholders and other debt instruments and multilateral institutions.

Firstly, this result can be explained by the fact that economic theory has shown that fiscal policy has a positive effect on long-term economic growth by stimulating capital formation, employment and innovation. This fiscal policy acts on capital formation through public investments such as the creation or maintenance of infrastructure.

To finance itself, the government can resort to the domestic financial market via the issue of bonds. This channel makes it possible to raise financing on long maturities compared to bank credits. These issued public securities allow the government to raise stable resources to contribute to the financing of public investments.

In the same vein, more recently, Ndikumana et al. (2015) have shown that only domestic resources (savings and credit to the private sector), and very marginally foreign direct investment, have a significant effect on domestic investment and economic growth in Africa. These empirical analyses were done on a sample of fifty (50) African countries covering the period from 1971 to 2012.

In addition, the system of issuing government securities allows the borrower to repay the debt gradually while avoiding a large one-off disbursement at the last maturity date, when the capital must be repaid in full. This system offers the borrower the possibility to make staggered and progressive repayments, it also gives him the possibility to deduct the interest paid for tax purposes, and of course, it allows him to have funds at his disposal over a long period.

When the country decides to raise financial resources on the financial market, it will issue a long-term bond divided into a certain number of shares which will be subscribed to by a large number of lenders. The latter acquires negotiable securities issued by the State as part of its loan issue. At the same time, they become holders of bonds which carry a coupon representing the interest rate of the loan issued by the State.

In addition, the public securities issued are generally at a fixed rate. This is due to the advantages of both the investor being assured of repayment (principal and interest known in advance), and the issuer knowing at the time of issue the exact amount it is committed to repaying to its lender, hence the possibility of accurately assessing its financial needs.

Thus, the results obtained to establish that external debt, development aid and diaspora transfers do not have a significant impact on the level of investment. The mobilisation of domestic resources is a major challenge for the State because of the opportunities of this financing resource.

Second, mobilising resources from multilateral institutions tends to lower the probability of default. This result could be explained by the fact that the IMF, the World Bank and the Regional Development Banks give high priority to public debt management.

Indeed, three attributes distinguish multilateral institutions:

- the multilateral shareholding structure;

- a subsidised capital base and access to other sources of subsidised funding;

- a privileged creditor status.

These attributes determine how Multilateral Banks select and monitor loans. They create incentives to comply with the terms and conditions of financing agreements. They also enable Multilateral Banks to provide grants as part of their financial and non-financial operations.

Loans from the World Bank, the African Development Bank, the Asian Development Bank, and the Inter-American Development Bank are mainly loans to governments. These are a form of budgetary financing, which is largely fungible in the sense that it frees up public resources for alternative uses until the loans are repaid. As financing mechanisms, Multilateral Banks have a number of features in common with micro-credit organisations, including the fact that they provide financial resources in high-risk contexts where legal and other institutional arrangements are underdeveloped.

According to Morduch (1999) and Armendariz de Aghion and Morduch (2000), micro-credit organisations have the particularity of mobilising social groups to screen and monitor the loans they grant. They also use threats of non-repayment, which, in the absence of alternative

sources of credit, encourage agents to repay. Finally, they create substitutes for traditional guarantees, such as self-insurance systems for borrowers against the risk of default.

Rather than relying on social groups, the Multilateral Banks rely on governments by involving them in the review of financing operations that are associated with domestic reforms. For these operations, the willingness of governments to reform is crucial.

The Multilateral Banks also exploit the incentives for compliance that arise from their repeated interactions with governments, as well as from their status as preferred creditors.

In addition, one of the major contributions of multilateral development banks is their ability to provide credit to middle-income countries at relatively low-interest rates. They succeed because, thanks to their financial credibility, they can raise funds on the markets on extremely favourable terms and pass the savings on to borrowers.

To this end, the loans granted to governments by multilateral banks are, on average, less expensive than the loans contracted by these countries on the international bond markets. The anticipated default rates on loans from Multilateral Banks are significantly lower and the anticipated repayment rates much higher than in the case of bonds and other types of international private financing.

Interest rates on loans to governments are set well below the interest rates at which governments can obtain financing on international capital markets.

Among multilateral, bilateral and private creditors, multilateral creditors are less likely to face a sovereign default (Schlegl. et al. 2017) and even less likely to participate in a restructuring. Public and private creditors have generally accepted that IMF financing, in particular, should be excluded from sovereign debt restructurings because IMF lending in a crisis situation is a public good that helps solve balance of payments problems (Lasra, 2014; Steinkamp, and Westermann, 2014; IMF, 2009; Rieffel, 2003).

Finally, among the mechanisms that promote compliance with the terms and conditions of Multilateral Bank loans are the dynamic incentives that emanate from the repeated interactions between borrowing governments and institutions. The potential for loan renewals, combined with the credible threat of future loan interruptions in the event of non-compliance with the terms and conditions set by the Multilateral Banks, can also help to ensure that the borrower will fulfil its commitments and decrease the possibility of non-payment.

Conclusion and Recommendations

The objective of this study is to analyse the effectiveness of budget deficit financing methods in Côte d'Ivoire. To do so, a brief review of the literature was necessary to explain the concept of credit scoring.

In Côte d'Ivoire, even if the public debt is considered sustainable, the analysis of sustainability by ratios (Debt sustainability analysis or DSA) has two limitations. On the one hand, these ratios are static because they do not take into account the evolution of the debt

over time. On the other hand, these ratios do not take into consideration Côte d'Ivoire's relationship with its financial partners. This relationship is a determining factor in the granting of loans, whether bilateral, multilateral or public securities.

Thus, in this article, we wanted to take these aspects into account and propose a credit scoring model adapted to the analysis of the effectiveness of the budget deficit financing methods in Côte d'Ivoire. This model will enable the Government of Côte d'Ivoire to evaluate the relevance of the different instruments for financing its budget deficit in relation to a default variable.

The choice of this model is based on default risk measures previously used for the private sector that have been redesigned for practical application in the public sector. These include Altman's Z-score model (1968) and Altman and Rijken's Z-Metrics model (2010). Also, rating agencies have their own measures of sovereign default risk. For Moody's, for example, there are indicators based on the KMV model (Crosbie, KMV, 1999). Brodsky et al. (2011) of the BlackRock Investment Institute propose a Sovereign Risk Index (SRI) and a Sovereign Vulnerability Index (SVI) that are used as benchmarks in financial markets. All these measures increasingly take into account the multidimensional nature of sovereign default risk. However, they are generally set for creditors even if the implications are important for borrowing states.

As a result, the results of our study of budget deficit financing instruments show that multilateral loans and public securities issues reduce the probability of payment default. Multilateral loans and government securities are the most appropriate financing methods to address the financing of the budget deficit in Côte d'Ivoire in order to avoid a payment default crisis. In other words, to ensure the country's debt sustainability, these financing instruments should be prioritised. The government should, therefore, seriously consider the necessary reforms to promote the use of these different instruments, as the model perfectly predicts the probability of default, i.e. 94.18%.

In the same way, Carlos Santiso (2006) shows that multilateral institutions contribute in various ways to the implementation of international standards of good financial and fiscal management in countries. He explains that the use of multilateral financial institutions to finance the national economy helps to improve public finances and fiscal governance. This thesis confirms our results because the intervention of multilateral institutions in the financing of the budget deficit strongly contributes to guarantee the sustainability of public debt through these conditionalities.

Based on these results, this study makes some recommendations. Firstly, since recourse to multilateral loans reduces the probability of default, it is important that the government take steps to further encourage budget deficit financing through the windows of multilateral institutions. To this end, the government should undertake reforms aimed at complying with evolving international standards of sound financial and fiscal management, which is a prerequisite for attracting multilateral financing.

Secondly, as government securities issuance has a positive impact on the probability of default, policymakers are encouraged to take actions to increase government securities issuance.

Françoise Magnan-Marionnet (2016) is right to argue that the development of the public securities market can play a significant role in raising resources and thus be a major catalyst for economic growth. Indeed, it allows for a better allocation of capital by offering alternative sources of financing and by diversifying risk among a large number of investors.

Thus, considering the results of our modelling, a number of measures can be taken to encourage the use of government securities:

- Strengthen communication with market participants, the Professional Association Management and Intermediation Company, the Undertakings for Collective Investment in Transferable Securities and institutional investors in particular, through the establishment of a permanent consultation framework;

- Continue the partnership with business providers and other authorised financial market participants (Undertakings for Collective Investment in Transferable Securities (UCITS), Asset Management Companies, etc.);

- Diversification of the investor base, particularly outside the West African Economic and Monetary Union (WAEMU);

- Intensified promotion of government securities to insurance companies, pension funds etc.;

- Expanding the secondary market for government securities;

- Improved financial communication would strengthen the Treasury's position with investors and financial partners;

Finally, the objective of guaranteeing fiscal sustainability in Côte d'Ivoire is supported by the need to increase government revenue. Since tax revenues constitute the majority of the country's income, tax policy is the preferred means. Fighting fraud and corruption is an essential factor in the sustainability of the tax system, as it could lead to an increase in the collection of tax resources.

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DOUBLE-EDGED SWORD OF CONTROLLING SHAREHOLDERS ON POLITICALLY CONNECTED GROUP BUSINESS[4]

This study aims to analyze the political connections, controlling shareholders, and financial report quality of affiliated companies in Indonesia. The research sample used 884 observations from group companies, and data analysis was performed using moderating regression analysis with panel data. The result showed that political connection weakens the financial report quality of the companies which are controlled by the family, but the role of independent commissioners can reduce the expropriation carried out by family-controlled toward minority shareholders. State-controlled firms have lower financial report quality than those which are family-controlled at all cut-off levels. The existence of political connections in the state companies weakens the effectiveness of the commissioners as a mechanism for the company's internal control. Keywords: Family block-holder; state block-holder; political connection; financial reporting quality; Indonesia.
JEL: M21; M41; G32

1. Introduction

The existence of large shareholders (controllers) is regarded as a double-edged sword in a company. The benefit-shared hypothesis shows that large shareholders have a function to monitor and control for better and effective management (mechanism of corporate governance). Thus, they have the power to reduce agency conflicts between management and

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stakeholders in a company. Some researchers provided empirical evidence that concentrated ownership can function as a corporate governance mechanism to control the management through better and more effective monitoring, so it will reduce agency conflicts (Tian, Cheung, 2013). Therefore, the existence of block holders in a company will have a positive impact on the firm value. On the other hand, their existence has adverse effects as well, since they can control the company to obtain private benefits over the control of minority shareholders. Moreover, their involvement in management is suspected to be expropriating by controlling company resources for personal gain and sacrificing the interests of minority shareholders and other stakeholders, such as debt holders, employees, and consumers, resulting in a negative impact on the firm value (Fattoum et al., 2018; Thi, 2018). This finding is following the argument stated by Claessens et al. (2000), namely the positive incentive effect (PIE) and negative entrenchment effect (NEE).

Conflicts in companies in the market of developing countries, especially in Indonesia, mostly occur between block holders and non-block holders (Claessens et al., 2000). When shareholders effectively control the company, they can also effectively determine the policies in the company as well as control the accounting reporting policies. Meanwhile, controlling shareholders can report accounting information for more personal purposes, rather than to reflect the actual performance of the company. Ngamchom (2015) and Yasser et al. (2017) documented that concentrated ownership has a negative effect on the quality of financial statements proxied by earnings management. The greater the concentration of ownership, the lower the quality of the financial reports. However, Xu et al. (2012) and Arthur et al. (2019) found a positive effect of ownership concentration on the quality of financial statements, this shows that the greater the family ownership, the better the financial report quality.

The concentration of state ownership can affect the financial report quality. The government or bureaucrats have social and political interests rather than merely being concerned to improve the company's performance; thus, the existence of state ownership control in companies can only weaken corporate governance. It will have an impact on reducing the state's control over managers as company managers (Shen, Lin, 2009). This lack of control will lead the managers to be able to freely earn profits. Hence, there is evidence that the companies which share controlled by the state produce relatively poor financial reports quality.

The strong network of political connections with the government is built by entrepreneurs and the controlling role of family and a state in group companies in Indonesia; whereas legal protection is still considered weak and the corruption level is still high, occupying the 85th position in the world (CPI, 2020). Such conditions make political connections very valuable for the company. Wati (2017) stated that political connections are proven to be able to provide various easy access and preferential treatment in companies. However, political connections also have a negative effect that can harm stakeholders, namely the problem of corporate governance in the openness and information disclosure which results in low-quality financial reporting.

There is empirical evidence that politically connected firms controlled by the family have poor financial reports quality (Chaney et al., 2011). It is easier for companies with family ownership to build political connections because of their kinship. Likewise, firms are

controlled by the state since politicians and state-controlled companies' managers have interests or incentives to withhold, limit, or obscure negative firm information (Piotroski et al., 2010).

This study examines the effect of political connections, and controlling shareholders on the financial reports quality of affiliated companies (groups) in Indonesia, given the fact that most of these companies are controlled by families and countries that have political networks or connections with the authorities. The use of the interaction of political connection variables with block holder as well as independent commissioners with block holder on financial reports quality to suppress asset expropriation distinguish this study from the previous ones. This study delves into the findings of Piotroski et al. 2010; Chen et al., 2011; Qian et al. 2011; Chaney et al., 2011; Ngamchom, 2015; Raimo et al., 2020 which separately examined the political connections and ownership structures to financial report quality and firm value. A level of ownership control (cut-off) of 10% - 50% for the interaction of political connection with family and state controllers was used in this study, which has not been discussed in previous research.

2. Literature Review

2.1. Agency Theory

Generally, the occurring conflicts of agencies in developing countries in Asia, such as Indonesia, are between block holders and minority shareholders. Block holders in developing countries who often act opportunistically can harm the interests of minority shareholders due to weak governance structures and legal protection, as well as complicated bureaucracy. La Porta et al. (2000) stated that the insider is management in a company with broad ownership, but in companies with concentrated ownership, the insider is no longer management but a controlling shareholder who can determine effectively the policies implemented by management. Furthermore, La Porta et al. (2000) found evidence of actions committed by block holders by tunnelling and expropriation, such as outright theft, issuance of diluted shares, which can discredit minority shareholders, and mergers between affiliated companies. These expropriation actions will eventually affect the financial reports quality. The expropriation action carried out by the block holder as well as management motivates to conceal the company's true performance to avoid interference from outside investors and discipline from the capital market authority.

Manipulation of the financial report in companies that constitute a business group is easily performed by creating pseudo transactions between companies through reciprocal debt guarantee, cross-shareholding, and internal transactions between the companies in the business group. As such, the group companies have a great opportunity to increase or decrease their income through internal selling, deferring profits and losses, and manipulating accounts payable and accounts receivable on related parties (Fan, Wong, 2002). These conditions have led the group companies to have the opportunity to hide their real financial performance, causing to reduce the quality and integrity of the financial report as well as the firm value (Okpamen, Ogbeide, 2020).

2.2. *The Effect of Family Ownership Concentration on the Financial Report Quality*

The block holders' role in a company is still a puzzle, whether they affect the company's performance. Concentrated ownership can function to monitor as a corporate governance mechanism for better and more effective management and eliminating agency conflicts so that the existence of controlling shareholders has a positive impact on the company value. Thus, with improved company value, agency problems can be reduced (Tian, Cheung, 2013). Moreover, the concentration of ownership and the involvement of controlling shareholders as insiders in management are thought to be able to control the company resources for personal gain and sacrifice the interests of minority shareholders (Fathoum et al., 2018; Thi, 2018). Jiang et al. (2020) conducted a study in China and found that companies with many block holders tend to have higher earnings management than those with a single controlling shareholder. This finding is following the arguments put forward by Claessens et al. (2000), namely the positive incentive effect (PIE) and negative entrenchment effect (NEE).

The positive incentive effect (PIE) argument states that controlling shareholders will not expropriate minority shareholders because they are the most disadvantaged if there is a decline in the firm value due to this expropriation. Meanwhile, the argument of the negative entrenchment effect (NEE) states that block holders exploit their ability to control management for their interests by expropriating minority shareholders (Claessens et al., 2000).

Highly concentrated ownership might enable the company's owner to greatly interfere with the management. When a shareholder can effectively control the company, he/she can also manage its financial report and accounting reporting policies. Then, the owner will report accounting information for his purposes rather than reflecting the actual firm. Arthur et al. (2019) found empirical evidence of a negative relationship between the widespread ownership structure without block holder with financial statement quality. Based on their findings, it implies that widespread ownership results in an entrenchment effect. However, when the ownership is primarily concentrated among the block holders whose aligned interests with the company, there turns a positive relationship of concentrated ownership with financial report quality and there is a domination of alignment effect.

Hashim & Devi (2008) examined the effect of board characteristics and ownership structure on the financial reports quality in Malaysia and the results of their research indicate that there is a positive effect between family ownership and the level of financial reports quality proxied by earnings quality. The higher the level of family ownership, the higher the level of financial report quality. This research finding is supported by those conducted by Cascino et al. (2010) and Alzoubi (2016), which show that the majority of shares owned by the family affect the level of financial statement quality. The greater the family shares ownership, the higher the quality level of the financial report. Based on the theoretical and empirical explanation above, the following hypothesis is developed:

H1: The family block holders have a positive effect on the financial report quality.

2.3. The Effect of State Block-holder on the Financial Report Quality

In the agency theory, a state as the block holder should be able to supervise or control the performance of managers; but often, the government has other objectives besides improving company performance and providing reports that can mislead investors. It will have an impact on reducing state control over managers as company managers. State-owned companies that are controlled by bureaucrats have goals based on political interests and not for the welfare of society and the company itself. The Type 1 agency conflict between the principal and the agent is different between state-owned and private companies. Private investors as controlling shareholders will actively monitor the company, while a company that is controlled by the government, they do not have strong control, or there is a tendency for weak monitoring ability. State-owned companies generally exhibit poor agency problems with conflicting goals since the companies are often misused to achieve short-term social and political goals. Finally, managers in these companies are responsible for the government instead of the shareholders (Shleifer, Vishny, 1994). This argument is supported by Nasr et al. (2012), who examined the quality of earnings generated by companies with state ownership using discretionary accruals as a measure of earnings quality. The results revealed that state ownership in companies was associated with low corporate earnings quality. State companies have weak monitoring capabilities due to the weak implementation of control systems.

Xu et al. (2012) found empirical evidence that there is a positive influence between state ownership structure on the quality of earnings reported by the companies in China even though the state-owned companies have a larger firm size and are more profitable. However, the quality of earnings on private ownership, foreign ownership, and organizational ownership is better than that of state ownership. Meanwhile, foreign ownership has the best earnings quality and the lowest earnings management detected. It is because the government cannot monitor corporate financial performance and has weak incentives, while foreign companies tend to be operated based on market mechanisms and high monitoring capabilities. This finding is supported by Raimo et al. (2020), who showed the negative research results of state ownership on the quality of integrated company reports. The greater the control of state ownership in the company, the worse the quality of the financial statements. In addition, Gaio & Pinto (2018) showed that state-owned companies in Europe have poorer quality of financial reporting than non-state companies. Likewise, the findings of Jiang et al. (2020) in China proved that government ownership has a positive effect on earnings management.

In contrast to the results of the aforementioned research, in general, which state that the existence of state ownership as the controlling shareholder is one of the main barriers to company efficiency, Wang & Yung (2011) and Hang et al. (2018) stated that companies controlled by state ownership have better financial reporting quality than that privately controlled ownership. Based on the theoretical and empirical explanations, the following hypothesis is developed:

H2: The state block holders affect the financial report quality.

2.4. Moderation of Political Connection to Block holders

Empirical evidence from the politically connected literature suggests that the financial report quality of politically connected firms differs from that of firms that are not politically connected. However, the results of the direction of the effect of political connections on the financial report quality vary. On the one hand, career development and bonus motives encourage the managers of politically connected companies to engage in positive or aggressive earnings management (Chaney et al., 2011; You, Du, 2012) so that politically connected firms show more aggressive earnings management than those which are not politically connected. On the other hand, politically connected companies can use negative (conservative) earnings management to obtain government bailouts and negotiate for more government assistance in the form of subsidies (Faccio et al., 2006; Fan et al., 2007).

Empirical studies conducted by Jacoby et al. (2019) showed that the performance of the financial statements of politically connected firms is lower than those which are not politically connected. The political connections can weaken or restrict managerial capabilities and increase the potential for fraudulent financial reports. The existence of political connections leads to increased levels of corruption and worsening asymmetric information between investors and managers (Chen et al., 2010). Based on the theoretical and empirical explanation above, the following hypothesis is formulated:

H3: Political connections have a negative effect on financial report quality

The quality of the financial report is judged by the extent to which the financial report presents true, transparent, and unbiased information. It is the management's responsibility to provide the information disclosed in the financial report to be used by external parties or investors as a consideration in the decision. A financial report should have integrity and reliability which consists of 3 components, namely verifiability, representational faithfulness, and neutrality. The practice of earning management in financial reports is a very important issue and it is one of the causes of losses to the integrity of accountants and company managers (Fischer, Rosenzweig, 1995). When a shareholder effectively controls the company, this party can also control the financial report and accounting reporting policies. The owner reports accounting information for personal interest rather than reflect actual performance.

Chaney et al. (2011) showed that companies in countries with weak investor protection tend to make political connections with large family ownership, which is considered easier for their management to carry out political relations because of their kinship. Qian et al. (2011) showed in their research that asset expropriation activities committed by the majority owner through tunnelling and propping are more commonly found in politically connected firms. Based on the theoretical and empirical explanation above, the following hypothesis is proposed:

H4: Political connection moderates the effect of the family block-holder on financial report quality.

Piotroski et al. (2010) examined the effect of politics in providing company information, in which they concluded that politicians and managers of state companies have motives or incentives to withhold, limit, or obscure negative corporate information. Because all the state

companies in Indonesia are politically connected, this study does not make a hypothesis of moderating political connections with the state-controlling shareholders on the financial report quality and firm value.

2.5. The role of the Independent Commissioner in Strengthening the Influence of block-holder on the Financial Report Quality

To see further whether there is expropriation in the affiliated companies (group) carried out by controlling shareholders in companies, the authors develop the second model by examining the interaction of independent commissioners on block holders and the firm value. The composition of the independent commissioners as a Good Corporate Governance (GCG) control mechanism is built based on the agency theory, which states that agents will act for personal interest and the NEE (negative entrenchment effect) approach, which states that the interest of majority shareholders is exercising their control rights to obtain private benefits by making expropriation, requiring the company for control tools. The existence of independent commissioners as a neutral board of commissioners in the company is expected to be able to control the behaviour of management and the majority shareholders, which can influence the management to act in their interests. If the GCG mechanism can improve the quality of the company's financial statements, it can be concluded that the GCG mechanism can properly perform a monitoring function so that it can minimize the occurrence of expropriation by controlling shareholders.

Man & Wong (2013) and Mohammed et al. (2017) stated that a company with a large independent board composition (one board system) would prevent opportunistic management behavior so that it can produce better quality financial statements. Wati (2017) states that a large number of independent commissioners (two boards systems) in politically connected firms are unable to optimize the monitoring function of the board of commissioners. The independent commissioners, which should act as the company's control mechanism, are unable to perform their function properly because of the large shareholders and political influence, which leads to a weak governance structure. Based on this explanation, two hypotheses are proposed on the interaction of the independent commissioner with the family block holder and the state on the financial report quality:

H5: Independent commissioners moderate the effect of family block-holder on financial report quality.

H6: Independent commissioners moderate the effect of state block-holder on financial report quality.

2.6. The Effect Control Variables on the Financial Report Quality

This study uses a control variable consisting of firm size as measured by log total assets, profitability as measured by return on assets, and leverage as measured by debt to assets ratio. Large companies have a high reputation risk which leads to less tendency to take earnings management actions than small ones because large ones are perceived as more critical by outsiders, i.e. investors, creditors, government, and society. Profitability is an important

indicator that can be used in a company assessment. The higher profitability reflects the batter company's performance which can provide positive signals for investors that can increase stock prices and firm value. High profitability can also lead to high earnings management practices, so profitability is considered one of the factors causing earnings management practices in companies that affect the integrity of financial statement reports.

Leverage is one of the motivations for earning management by increasing profits. A company with high leverage tends to pose a high risk of not being able to fulfil its obligations, so it will strive to show good performance and confidence that the company can pay its obligations to creditors. Affiliated companies (groups) tend to have higher debt ratios to make it easier for them to borrow from banks or seek debt from the capital market. This convenience is due to the diversification nature of large companies, which causes the default risk of large companies to be considered lower.

Based on theoretical studies and previous research, the authors outline the following framework (see Figure 1):

Figure 1. Conceptual Framework

3. Methodology

This study uses a quantitative method with a causal design that is testing the influence between variables. The independent variables used were family block holders, state block holders, and political connections, while independent commissioners acted as moderating variables. The quality of financial reports was taken as the dependent variable with the

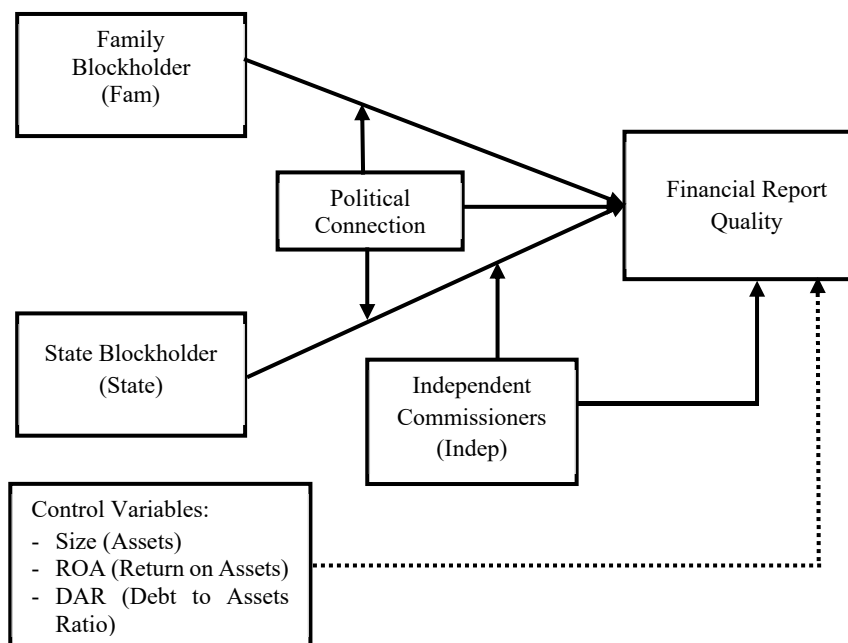discretionary accrual proxy used by the Jones model. This study used a control variable consisting of firm size as measured by log total assets, profitability as measured by return on assets (ROA), and leverage as measured by debt to assets ratio/DAR (Wati, 2017). The controlling shareholder was the largest owner in a company with a minimum ownership limit of 10%. The definition of family used in this study refers to Claessans et al. (2000), namely all individuals and companies whose ownership is recorded (ownership of 5% and above must be recorded), except for public companies, state companies, financial institutions (such as investment institutions, mutual funds, insurance, pension funds, banks, and cooperatives). After calculating the total family ownership, a dummy variable was made with a value of 1 if the company was controlled by the family and a value of 0 if it was not controlled by the family at the cut-off of 10%, 20%, 30%, 40%, and 50%. A similar manner was used to measure the variable of the state block holder.

The population of this research was group companies listed on the Indonesia Stock Exchange, the total samples of which were 68 companies from 2005-2017; thus, the total data used in this study reached 884 data.

For a robust model of the financial report, the quality uses the discretionary accrual Kothari model. The accrual discretion value resulting from the calculation of earnings management in both the Jones Model and the Kothari model is multiplied by a negative one to ensure that a positive value indicates a higher financial report quality. If the discretionary accrual value is negative, earnings management is carried out by reducing the earnings. On the other hand, if the value of discretionary accruals is positive, earnings management is carried out by increasing the earnings. However, if the discretionary accrual value is zero, there is no indication of earnings management carried out by the company.

The research model uses moderating regression analysis as follows:

Hypothesis 1 and 4 were tested using Model 1

$$DAC_{Jones} = \alpha_1 + \beta 1 Fam_{it} + \beta 2 PC_{it} * Fam_{it} + \beta 3 Size_{it} + \beta 4 DAR_{it} + \beta 5 ROA_{it} + \varepsilon_1 \ldots \quad (1)$$

Hypothesis 2 and 3 were tested using Model 2

$$DAC_{Jones} = \alpha_1 + \beta 1 PC_{it} + \beta 2 State_{it} + \beta 3 Size_{it} + \beta 4 DAR_{it} + \beta 5 ROA_{it} + \varepsilon_2 \ldots \quad (2)$$

Hypothesis 5 was tested using Model 3

$$DAC_{Jones} = \alpha_1 + \beta 1 PC_{it} + \beta 2 State_{it} + \beta 3 Size_{it} + \beta 4 DAR_{it} + \beta 5 ROA_{it} + \varepsilon_3 \ldots \quad (3)$$

Hypothesis 6 was tested using Model 4

$$DAC_{Jones} = \alpha_1 + \beta 1 Indep_{it} * Fam_{it} + \beta 2 Size_{it} + \beta 3 DAR_{it} + \beta 4 ROA_{it} + \varepsilon_4 \ldots \quad (4)$$

4. Results and Discussion

The column of family block holders in the group company shows that the family is the main block holder in all of the cut-off 10% - 50%, namely 42.3%, 49.2%, 52.7%, 52.3%, and 51% respectively (Table 1).

Table 1. Block-holder from 2005-2017

Year	Family Block holder					State Block holder				
	Cut Off					Cut Off				
	10% (%)	20% (%)	30% (%)	40% (%)	50% (%)	10% (%)	20% (%)	30% (%)	40% (%)	50% (%)
2005	42.28	57.78	58.75	61.33	57.81	8.13	10.00	11.25	12.00	14.06
2006	42.40	58.89	59.49	60.53	56.06	8.00	10.00	12.66	13.16	15.15
2007	43.97	53.26	53.85	56.16	54.41	8.62	9.78	12.82	13.70	14.71
2008	42.74	51.04	53.09	55.56	53.73	8.55	9.38	12.35	13.89	14.93
2009	44.25	51.02	54.88	52.05	50.00	8.85	9.18	12.20	13.70	14.71
2010	42.34	51.09	53.25	51.43	51.56	9.01	9.78	12.99	14.29	15.63
2011	34.97	45.26	51.32	48.48	47.54	6.99	9.47	13.16	15.15	16.39
2012	39.82	43.75	48.15	49.25	49.18	8.85	9.38	12.35	14.93	16.39
2013	41.59	45.26	50.00	46.58	48.44	8.85	9.47	12.50	13.70	15.63
2014	41.07	44.33	50.00	46.05	48.48	8.93	9.28	12.20	13.16	15.15
2015	43.40	47.87	50.63	48.65	48.48	9.43	9.57	12.66	13.51	15.15
2016	44.55	45.65	49.35	50.00	46.88	10.89	9.78	12.99	14.29	15.63
2017	47.06	44.90	52.63	53.33	50.72	9.80	19.39	13.16	13.33	14.49
Mean	42.3	49.2	52.7	52.3	51.0	8.8	10.3	12.6	13.8	15.2

Source: Authors Calculation.

The results of this study support Claessens et al. (2000), who state that the number of family companies is 53% and the largest family block holders are in Indonesia at 69%. This empirical evidence is consistent with the findings of La Porta et al. (1999), who stated that the family dominates the ownership of public companies, especially those affiliated with business groups.

Table 2. Descriptive statistics from 2005-2017

Variable	Minimum	Maximum	Mean	St. Deviate
Accruals Jones	-33.04982491	25.77771972	0.027396337	2.367474779
Accruals Kothari	-33.11888289	25.73595424	-0.03155117	2.363065877
Political Connection	0	1	0.726244344	0.446137483
Firm Size	10.92507476	15.05163403	12.97854499	0.732019031
Leverage	0.007878413	5.771426369	0.700698612	0.568431159
ROA	-1.075380856	1.235713602	0.058947507	0.127479599

Source: Authors Calculation

Table 2 describes that the lowest discretional accrual value in the group company is -33.05 while the highest is 25.77, with an average value of 0.027. The average value of discretional accruals in group companies indicates a positive 0.0273, which means that group companies carry out earning management by increasing profits or overstatements. These results are consistent with the study of Wati et al. (2020), where large companies tend to carry out earnings management by increasing company profits. The minimum size value in the group

company is 10.93 whereas the maximum value is 15.05 with an average value of 12.98. The average value of return on assets is 5.89%, while the standard deviation value is 12.74%. The high difference in ROA value is due to the negative equity value in the 6 companies. The average leverage in the group companies is 0.701. These results indicate that the majority of the members of the business group are large, profitable, and high degree of leverage companies.

Table 3. Test results of Model 1

$$DAC_{Jones} = \alpha_1 + \beta 1 Fam_{it} + \beta 2 PC_{it} * Fam_{it} + \beta 3 Size_{it} + \beta 4 DAR_{it} + \beta 5 ROA_{it} + \varepsilon_1 \dots (1)$$

Variables	PANEL A. FAMILY MODEL					
	Research Model (Jones)					Result
	Cut Off					
	10%	20%	30%	40%	50%	
Constant	-0.861***	-0.986***	-0.440***	-0.472***	-0.315***	
FAM	0.169***	0.241***	0.192***	0.299***	0.106***	Supported
PC*FAM	-0.019	-0.073***	-0.086***	-0.211***	-0.025*	Supported
SIZE	0.059***	0.068***	0.029***	0.033***	0.022***	Supported
DAR	0.027**	0.020	0.0189	0.021*	0.001	Unsupported
ROA	-0.629***	-0.645***	-0.685***	-0.698***	-0.601***	Supported
R-squared	0.130	0.177	0.203	0.304	0.197	
Adjusted R^2	0.125	0.173	0.198	0.300	0.192	
F-statistic	26.271***	37.833***	44.693***	76.536***	42.936***	
	PANEL B. FAMILY ROBUST					
Variables	Robust Model (Kothari)					Result
	Cut Off					
	10%	20%	30%	40%	50%	
Constant	-0.861***	-0.986***	-0.440***	-0.472***	-0.315***	
FAM	0.169***	0.241***	0.192***	0.299***	0.106***	Supported
PC*FAM	-0.019	-0.073***	-0.086***	-0.211***	-0.025*	Supported
SIZE	0.059***	0.068***	0.029***	0.033***	0.022***	Supported
DAR	0.027**	0.020	0.019	0.021*	0.0011	Unsupported
ROA	0.371***	0.355***	0.315***	0.302***	0.399***	Supported
R-Squared	0.134	0.152	0.166	0.221	0.203	
Adjusted R^2	0.129	0.147	0.161	0.217	0.199	
F-statistic	27.169	31.501	34.873	49.854	44.659	

Notes: *** Sig α 1%, ** Sig α 5%, * Sig α 10%.
Source: Authors Calculation

The test results of the first model indicate that family controllers have a positive effect on the financial report quality at all cut-off levels 10% - 50% at the significance level of 1% (see Table 3). These results indicate that the existence of the family block holder can improve the quality of the financial report. The results of this study support the findings of Hashim and Devi (2008), Cascino et al. (2010), and Alzoubi (2016), which revealed that large shareholders in the company are motivated to conduct better monitoring by managers. This study also supports that large shareholders at a higher level of ownership have a positive effect on the financial report quality. This empirical evidence supports the positive incentive effect (PIE) theory which states that block holders will not expropriate minority shareholders because controlling shareholders are the most disadvantaged if there is earnings management which can reduce the financial report quality. However, empirical evidence shows different results when using interaction with political connections.

The results showed that political connections weaken the effect of family block holder on the financial report quality at a cut of 20-50%. It indicates that the financial report quality of politically connected firms controlled by the family is worse than that of politically connected firms controlled by the family. These results support the findings of Chaney et al. (2011), which showed that family block holders in countries with weak investor protection tend to make political connections. Family ownership is considerably easy for companies to carry out political connections because of their kinship. This finding implies that family companies can very easily control the company and are directly involved in the company (insider) to determine policies that benefit them. They can freely determine who deserves to occupy the position of the board of commissioners, independent commissioner, or president commissioner who can provide benefit to both their interests and the company.

The variable control firm size on the financial report quality has a positive effect on all cut-off levels of 10%-50%. These results support the theory of political cost hypotheses in which large companies are faced with a great responsibility to maintain their good name and reputation, so that the larger the firm size (assets), the better the financial report quality. Leverage can improve financial report quality only at the level of 10% and 40%. These results describe that the greater the firm debt, the better the financial report quality. Debt contracts are signed by managers and creditors to ensure the managers carry out economic activities which lead to efforts to repay loans according to the agreed time. Such a contract can encourage creditors to ensure managers work based on the procedures to increase their ability to pay loan funds. Meanwhile, firm profitability can reduce financial report quality at all cut-off levels of 10% - 50%. Empirical evidence shows that high profitability can lead to the high practice of earning management, so profitability is considered as a factor, causing earnings management practices.

The state block holder has a significantly negative effect on the financial report quality at all cut-off levels, namely 10%, 20%, 30%, 40%, and 50%, at the significance level of 1% (see Table 4). The results of the research support the conventional finding that state ownership is the main barrier to company efficiency. The government is unable to monitor the financial performance of the companies and provides weak incentives (Raimo et al., 2020; Gaio, Pinto, 2018). Thus, greater control of state ownership in companies worsens the financial report quality. The government's supervisory role is also unable to prevent earnings management, while its weak protection of these firms cannot reduce the pressure on managers to exercise earnings management.

All state-owned companies in Indonesia are politically connected, so this research did not investigate the interaction of political connections with state-controlling shareholders on the financial report quality. However, we directly examined the effect of political connections on the financial report quality at all cut-offs. The results showed that in all cut-offs of 10% - 50%, political connections have a negative effect on the financial reports quality with a significance level of 1%. This empirical evidence supports previous studies conducted by Chaney et al., 2011; Jiang et al., 2020 which showed that political connections have a negative effect on the quality of corporate financial reports. In other words, the financial reports quality of companies with political connections is lower than those which are not politically connected. Therefore, political connections can weaken or restrict managerial

ability while increasing the potential for financial reporting fraud, especially for companies in countries with high levels of corruption (Faccio, 2010; Chen et al., 2010).

Table 4. Test Results of Model 2

$$DAC_{Jones} = \alpha_1 + \beta1PC_{it} + \beta2State_{it} + \beta3Size_{it} + \beta4DAR_{it} + \beta5ROA_{it} + \varepsilon_2 \ldots (2)$$

Variables	PANEL A. RESEARCH MODEL (STATE)					Result
	Cut Off					
	10%	20%	30%	40%	50%	
Constant	-1.508***	-1.476***	-1.490***	-1.490***	-1.490***	
PC	-0.096***	-0.094***	-0.094***	-0.094***	-0.094***	Supported
STATE	-0.290***	-0.341***	-0.338***	-0.338***	-0.338***	Supported
SIZE	0.124***	0.121***	0.122***	0.122***	0.122***	Supported
DAR	0.093***	0.095***	0.095***	0.095***	0.095***	Supported
ROA	-0.491***	-0.444***	-0.446***	-0.446***	-0.446***	Supported
R-Squared	0.154	0.154	0.154	0.154	0.154	
Adjusted R^2	0.1493	0.1493	0.1491	0.1491	0.1491	
F-statistic	31.986***	32.003***	31.940***	31.940***	31.940***	
Variables	PANEL B. STATE ROBUST Robust Model (Kothari)					Result
	Cut Off					
	10%	20%	30%	40%	50%	
Constant	-1.508***	-1.476***	-1.490***	-1.490***	-1.490***	
PC	-0.096***	-0.094***	-0.094***	-0.094***	-0.094***	Supported
STATE	-0.290***	-0.341***	-0.338***	-0.338***	-0.338***	Supported
SIZE	0.124***	0.121***	0.122***	0.122***	0.122***	Supported
DAR	0.093***	0.095***	0.095***	0.095***	0.095***	Supported
ROA	0.509***	0.556***	0.554***	0.554***	0.554***	Supported
R-Squared	0.1993	0.200	0.1989	0.1989	0.1989	
Adjusted R^2	0.1947	0.1957	0.1943	0.1943	0.1943	
F-statistic	43.720***	43.964***	43.600***	43.600***	43.600***	

Note: *** Sig α 1%, ** Sig α 5%, * Sig α 10%.
Source: Authors Calculation

To see whether there is expropriation in the group company by the block holder in the company, a test was carried out regarding the interaction of independent commissioners on the family block holder on the quality of financial statements.

Table 5. Test Results of Model 3

$$DAC_{Jones} = \alpha_1 + \beta1Indep_{it} * Fam_{it} + \beta2Size_{it} + \beta3DAR_{it} + \beta4ROA_{it} + \varepsilon_3 \ldots (3)$$

Variables	Research Model (Family)					Result
	Cut Off					
	10%	20%	30%	40%	50%	
Constant	-0.343***	-0.422***	-0.383***	-0.4673***	-0.278***	
INDEP*FAM	0.182***	0.227***	0.167***	0.146***	0.175***	Supported
SIZE	0.021***	0.026***	0.026***	0.033***	0.019***	Supported
DAR	0.046***	0.043***	0.033**	0.034***	0.010	Supported
ROA	-0.537***	-0.578***	-0.559***	-0.562***	-0.564***	Supported
R-Squared	0.0698	0.0905	0.0857	0.1022	0.1083	
Adjusted R^2	0.0656	0.0864	0.0816	0.0981	0.1042	
F-statistic	16.502***	21.877***	20.608***	25.003***	26.620***	

Note: *** Sig α 1%, ** Sig α 5%, * Sig α 10%.
Source: Authors Calculation

Based on Table 5, the test results show that the existence of an independent commissioners as a company's internal control mechanism can perform a monitoring function properly to improve financial report quality. The interaction of independent commissioners in controlling the family block holder can protect the rights of shareholders, especially the minority ones; so that the GCG mechanism with the existence of an independent board in a company controlled by the family can minimize expropriation. This empirical evidence supports the research results of Man & Wong (2013) and Mohammed et al. (2017), who stated that companies with a large composition of the independent board would prevent opportunistic management behaviour, resulting in better financial reports. This difference indicates that the existence of independent commissioners in companies controlled by the family is more effective than in those which are not family-controlled; so the family-controlled companies produce better financial reports quality.

To determine whether there is expropriation in the group company by the state block holder, a test was carried out regarding the interaction of independent commissioners in the state block holder on the financial report quality.

The test results of the independent commissioners' interactions in companies controlled by the government show negative results (see Table 6). This result provides different empirical evidence from family controlling shareholders. The existence of independent commissioners is an ineffective internal control mechanism in companies controlled by the government. This empirical evidence supports the phenomenon and previous research where most of the board of commissioners and independent commissioners in state-owned companies are politically connected as they used to be the successful teams of election winners. The management will generally commit earnings management to hide the costs incurred for the connection. Politically connected firms usually have a board of commissioners consisting of current and non-current government bureaucrats. The board of commissioners, which consists of bureaucrats, shows a lack of professionalism, and few of the company's leaders have relevant professional backgrounds, thus weakening the control mechanism over the company (Fan et al., 2007). The robust test results for all research models using the Kothari accrual discretionary model show consistent results with the Jones model. That is, all research models are robust.

Table 6. Test results of Model 4 (State)

$$DAC_{Jones} = \alpha_1 + \beta1 Indep_{it} * State_{it} + \beta2 Size_{it} + \beta3 DAR_{it} + \beta4 ROA_{it} + \varepsilon_4 \dots (4)$$

Variables	Research Model (State)					Result
	Cut Off					
	10%	20%	30%	40%	50%	
Constant	-1.548***	-1.529***	-1.539***	-1.539***	-1.539***	
INDEP*STATE	-0.508***	-0.609***	-0.602***	-0.602***	-0.602***	Supported
SIZE	0.120***	0.119***	0.119***	0.119***	0.119***	Supported
DAR	0.082***	0.085***	0.085***	0.085***	0.085***	Supported
ROA	-0.542***	-0.508***	-0.510***	-0.510***	-0.510***	Supported
R-Squared	0.165	0.170	0.169	0.169	0.169	
Adjusted R^2	0.1608	0.1661	0.1655	0.1655	0.1655	
F-statistic	43.311***	44.984***	44.792***	44.792***	44.792***	

Note: *** Sig α 1%, ** Sig α 5%, * Sig α 10%.
Source: Authors Calculation.

5. Conclusion

This study concludes that controlling shareholders and political connections affect the financial report quality on the companies affiliated with a business group. The family block holder has a positive significant effect on financial report quality, but when it is politically connected, the financial report quality decreases at all cut-offs. This result shows that political connections weaken the financial report quality of the family-controlled company. There are positive results based on testing on the interaction of independent commissioners on family block holders as an effort to reduce expropriation by controlling shareholders to minority shareholders. The existence of a large number of independent commissioners will prevent management from opportunistic behaviour so that the family-controlled company can produce a better quality of financial reports. The state-controlled company has a poor quality of financial reports than those family-controlled in all cut-offs. The strong grip of political connections in state-owned companies causes the management to be unable to monitor the company's financial performance and to provision weak incentives. The government's supervisory role is unable to prevent earnings management, while the weak government protection of these firms cannot reduce the pressure on managers to conduct earnings management. The results test on the interaction of independent commissioners with state block holders to reduce expropriation show negative results. The independent commissioners, as the internal control mechanism, cannot improve the quality of the financial reports. The existence of independent commissioners in a state-controlled company as its internal control mechanism is not sufficiently effective.

The implications of the study results are investors should more carefully consider the negative consequences of politically connected firms. In addition to the benefit of political connections, there is a high cost the company might bear, which affects the financial report quality. It is necessary to establish policies that regulate the prohibition of Board of Directors (BOD) and Board of Commissioners (BOC) who concurrently occupy the state high officials in countries that implement a two-board system, such as in Indonesia. It needs to revise existing regulations regarding the qualifications of the board of commissioners, so that the company has the law in placing a truly professional board of commissioners for the benefit of the company and its stakeholders, to minimize the company's desire to seek political rent with high state officials and able to compete fairly (e.g. Indonesia needs to revise Regulation of the Financial Services Authority Number 30 of 2014 concerning the Board of Directors and Board of Commissioners of the Listed or Public Companies). The findings regarding the existence of independent commissioners can minimize the expropriation of controlling shareholders, it is recommended that the company increase the number of independent commissioners who can represent the interests of minority shareholders. This study recommends that companies recruit boards of commissioners who have integrity, educational background, and experience in the company's line of business or business background and are also capable of representing the minority shareholder's interests.

However, there are several limitations in this study, such as no further testing on expropriation carried out in group companies. Furthermore, the study only used a sample of group companies without comparison with a single company. Therefore, future research is expected to further investigate the expropriation carried out by affiliated companies in the

business group and use a cost-and-benefit comparison of political connections as well as controlling shareholders in the group and single companies.

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ASSESSING THE IMPACT OF INVESTMENT PROJECTS FOR THE DEVELOPMENT OF INLAND WATERWAY TRANSPORT ON SOCIAL AND ECONOMIC INDICATORS IN REGIONS[5]

Currently, when preparing substantiating materials for investment projects to be included into governmental programs of the Russian Federation, no assessment is performed of the project's impact on social and economic indicators of constituent entities of the Russian Federation, where the investment project is implemented, such as the GRP, the volume of export and shipment of products of own production, reducing the social inequality and unemployment, increasing the total factor-based productivity. Our research hypothesis is the assumption of the positive impact of implementing governmental investment projects on the indicators of social and economic development in constituent entities of the Russian Federation. Therefore, the purpose of our research is to assess the impact of implementing investment projects for the development of inland waterway transport infrastructure, that are financed from the federal budget, on the social and economic development indicators in constituent entities of the Russian Federation. In our study, we assessed the impact of implementing investment projects for the development of inland waterway transport infrastructure on the social and economic indicators of constituent entities of the Russian Federation using the Difference-in-Differences method and the probabilistic and quantitative assessment of the impact of implementing investment projects on social and economic indicators of constituent entities of the Russian Federation using the Bayesian modelling. The calculations presented in this paper showed that the use of the Bayesian modelling method to assess the probability of the investment projects impact on the indicators of social and economic development in constituent entities of the Russian

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Federation will allow, before making a decision to launch an investment project, to have an idea about its economic effects for the region. The suggested methodological approach to assessing the impact of investment projects on the social and economic development of regions can be used in the practical activities of public authorities at the stage of selecting investment projects and assessing capital investments.
Keywords: governmental investment projects; regional economy; impact on regional social and economic indicators; quantitative assessment; Difference-in-Differences method; Bayesian modelling
JEL: C11; C15; C51; E15; H54

1. Introduction

The relevance of the research topic is due to the need to solve the problems accumulated in the development of inland waterway transport infrastructure through implementing investment projects with state participation with limited federal budget funds available.

According to Bryan, J. (2006), ensuring the sustainable and efficient functioning of the transport system is the most important area of the governmental economic policy (Bryan et al., 2006). The transport system largely determines the level and dynamics of economic development both of individual regions and the country in general.

Haezendonck, E. (2007) emphasizes that the very nature of the transport sector significantly complicates assessing the effects of investment projects on the social and economic development of a region and the country in general, as the transport sector development is not a direct source of GDP and GRP growth, but it eliminates infrastructural restrictions for the development of other sectors of the economy (Haezendonck, 2007). This feature of the transport sector is more expressed in the nature of inland waterway transport, given the lack of feasibility and, often, the impossibility of creating the related infrastructure along most of the inland waterways running through uninhabited areas. Rogers, P. J. (2000) believes that the use of governmental programs as part of the development of various industries (including the transport one) helps to increase the competitiveness of domestic products (Rogers, 2000).

From the period of establishing the Russian state to the start of the widespread use of railway transport, the inland waterway transport was the most important mode of transport for our country.

Currently, the state of this industry as a whole can be described as depressive: the moral and physical obsolescence of navigable waterworks, that of the service fleet, and the deterioration of inland waterways. This state of the industry is due to regular underfunding of its infrastructure development, as well as non-market patterns of distributing freight flows between various modes of transport. There are some natural restrictions in inland waterway transport as freezing and termination of navigation in the winter months in certain areas of the network and restriction of transport routes due to the geographical location of rivers.

At the same time, there are opportunities to get out of this situation and to reach significant growth in freight and passenger turnover, as the industry has the following relative advantages:

- a low cost of transportation of goods and passengers, due to the lack of significant expenses for maintaining the inland waterways infrastructure (unlike other types of transport, on inland waterway transport, the maintenance of the infrastructure of inland waterways is carried out at the expense of the Russian Federation, and not shippers or other owners of transport infrastructure) and the low cost of operating vessels (due to technical characteristic of vessels);

- a high carrying capacity, as well as the possibility of carrying oversized cargoes;

- the ability to transport goods to hard-to-reach areas of the Far North and equivalent territories, often being the only way to deliver goods and passengers.

2. Data and Methods

According to the Federal State Statistics Service (Rosstat), the freight turnover by inland waterway transport on a commercial basis in Russia amounted to 66.0 billion ton-kilometres in 2021.

Table 1 shows the actual volumes of freight turnover in the Russian Federation by modes of transport and the specific weights of each mode of transport in the total freight turnover.

According to official data provided by Rosstat of Russia, the share of inland waterway transport in the total freight turnover in the Russian Federation amounted to 1.2% in 2021, taking into account pipeline transport.

*Table 1. Freight turnover in the Russian Federation in 2000-2021 by modes of transport*

Mode of transport	2000		2005		2010		2015		2021	
	bln t-km	Specific weight, %	bln t-km	Specific weight, %	bln t-km	Specific weight, %	bln t-km	Specific weight, %	bln t-km	Specific weight, %
Transport – total	**3,638**	**100.0**	**4,676**	**100.0**	**4,752**	**100.0**	**5,108**	**100.0**	**5644**	**100.0**
railways	1,373	37.7	1,858	39.7	2,011	42.3	2,306	45.1	2598	46.0
motor vehicles	153	4.2	194	4.1	199	4.2	247	4.8	259	4.6
pipelines	1,916	52.7	2,474	52.9	2,382	50.1	2,444	47.8	2668	47.3
marine ships	122	3.4	60	1.3	100	2.1	42	0.8	45	0.8
inland water-ways	**71**	**2.0**	**87**	**1.9**	**54**	**1.1**	**64**	**1.3**	**66**	**1.2**
aviation	2.5	0.1	2.8	0.1	4.7	0.1	5.6	0.1	7.8	0.1

However, it should be noted that, with an increase in the total freight turnover in the Russian Federation by 1.6 times, the share of inland waterways decreased by 1.6 times.

During the studied period from 2000 to 2021, the freight turnover by inland waterway transport in the Russian Federation was decreasing by an average of 0.4% per year.

Figure 1 shows the growth rate dynamics of the freight turnover in general by modes of transport and by inland waterway transport (IWWT) in 2000-2021.

Figure 1. Growth rate of freight turnover in the Russian Federation
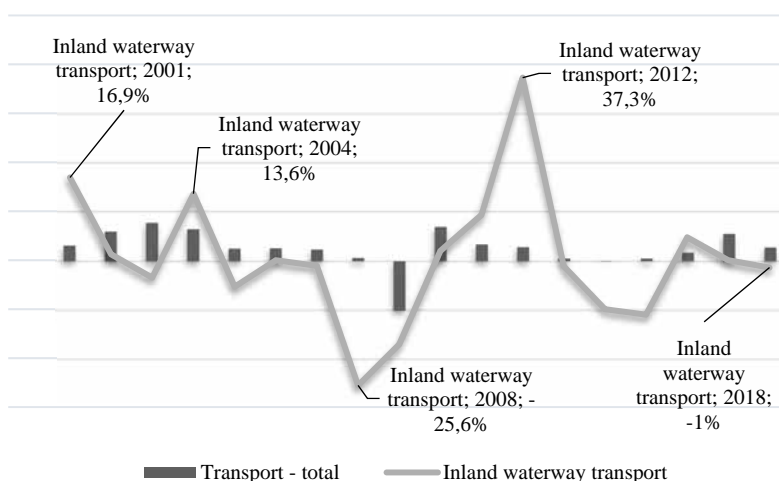
The main reason for significant fluctuations in the IWWT freight turnover is the nature of the main cargo transported: the bulk of goods transported by IWWT is raw materials for the construction sector, which causes significant fluctuations and instability in the cargo transportation volume, given the large dependence of the construction sector's growth dynamics on the economic situation in the country.

According to Rosstat, the passenger turnover of inland waterway transport in Russia amounted to 0.6 billion passenger-kilometres in 2021.

Table 2 shows the actual passenger turnover in the Russian Federation by modes of transport and the specific weights of each mode of transport in the total passenger turnover.

According to official data provided by Rosstat of Russia, the specific weight of the inland waterway transport in the total passenger turnover in the Russian Federation amounted to 0.1% in 2021.

It should be noted that, with an overall increase in the passenger turnover by 1.2 times, the share of passenger turnover by inland waterway transport in the total passenger turnover decreased by 2 times.

We have found that, over the studied period of 2000-2021, the passenger turnover of inland waterway transport in the Russian Federation was decreasing by an average of 2.3% per year.

Table 2. Freight turnover in the Russian Federation in 2000-2021 by modes of transport

Mode of transport	2000		2005		2010		2015		2021	
	bln passenger-km	Specific weight, %	bln passenger-km	Specific weight, %	bln passenger-km	Specific weight, %	bln passenger-km	Specific weight, %	bln passenger-km	Specific weight, %
Transport – total	**496.2**	**100.00**	**473.3**	**100.00**	**484. 0**	**100.00**	**530.0**	**100.0 0**	**594.4**	**100.00**
railway	167.1	33.68	172.2	36.38	138. 9	28.70	120.6	22.75	129.5	21.79
autobus	173.7	35.01	142.3	30.07	140. 6	29.05	126.3	23.83	122.9	20.68
passenger taxi	0.2	0.04	0.1	0.02	0.3	0.06	0.3	0.06	0.4	0.07
tramway	25.1	5.06	13.5	2.85	6.7	1.38	4.8	0.91	3.9	0.66
trolleybus	28.1	5.66	15.0	3.17	7.1	1.47	6.0	1.13	4.7	0.79
subway	46.9	9.45	43.4	9.17	42.4	8.76	44.6	8.42	45.4	7.64
marine vessels	0.1	0.02	0.09	0.02	0.06	0.01	0.06	0.01	0.06	0.01
inland waterways	**1.0**	**0.20**	**0.9**	**0.19**	**0.8**	**0.17**	**0.5**	**0.09**	**0.6**	**0.10**
aviation	54.0	10.88	85.8	18.13	147. 1	30.39	226.8	42.79	286.9	48.27

Figure 2. Passenger turnover growth rate in the Russian Federation
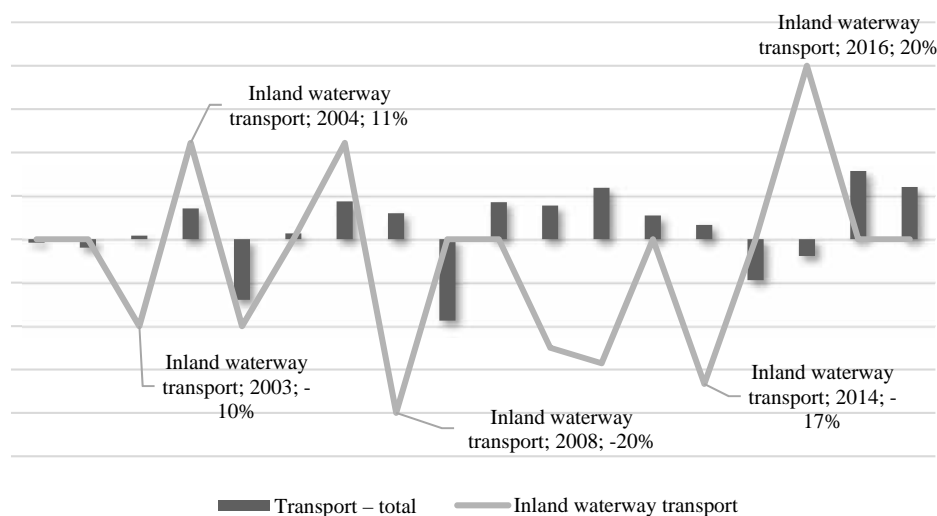
The main reason for the significant fluctuations in the IWWT passenger turnover is the very nature of these transport services. Given that most of the passengers transported are tourists, any fluctuations in the economic growth of the Russian Federation, including the people's income level, significantly affect the IWWT passenger turnover.

The decrease in the freight and passenger turnover by inland waterway transport is due to the following reasons:

- the existence of sections ("bottlenecks") limiting the throughput capacity;

- the obsolescence of the river fleet (both cargo and service vessels);

- the lack of modern loading and unloading facilities;

- underdeveloped intermodal transport and logistics centers;

- the prioritization of federal budget expenditures in favour of other modes of transport (Afanasiev et al., 2010) [4,5].

In this paper, as the subject of our research, we have chosen federal government bodies carrying out investment activities to develop the waterway transport infrastructure financed from the federal budget. We are considering the infrastructure that, under Russian law, is classified as federal property only.

A large part of the inland waterway transport infrastructure has been created during the existence of the USSR and needs significant modernization, taking into account wear and tear, the territorial displacement of economic centres, and climatic changes affecting the possibility of navigation. We should especially note the importance of waterways of The Unified Deep-water System of European Russia (the length of which in the Russian Federation is over 6.5 thousand km) for the national and regional economy, since they are serving about 70% of the total freight turnover, including exports and imports.

In accordance with the Geneva Agreement of January 19, 1996, signed and ratified by the Russian Federation in 2000, the Unified Deep-water System of the European part of the Russian Federation is included in the most important inland waterways of international importance, while the Russian Federation has undertaken to maintain a guaranteed depth of 4 meters of ship traffic throughout this Unified Deep-water System.

However, in some areas of "bottlenecks", the guaranteed depth is no more than 3.2 m.

The presence of limiting sections hinders the development programs of businesses in the sector.

E.g. according to data provided by consignors, the losses of shipping companies due to incomplete use of the carrying capacity only along the limiting section in the Nizhny Novgorod Region are about 5.9 bln rubles per year.

At the same time, construction of inland waterway transport infrastructure is very expensive and requires a willingness to wait for a long time for the project payback period.

Therefore, taking into account the existence of significant infrastructure problems, federal executive authorities are faced with the need to select investment projects for investment, such investment projects being located in various regions and aiming at solving different tasks.

In this context, the choice of an investment project is based on the general needs of the inland waterway transport system, without taking into account the impact of implementing such investment projects on the social and economic development of constituent entities of the Russian Federation.

Meanwhile, the federative constituent entities' interest in implementing an investment project largely determines the probability of completing such a project on time, its cost, and its scope of work.

Assessing the social and economic effects of investment projects in the field of transport infrastructure on the development of Russian regions is an urgent, both practical and scientific problem, because of allocating a significant amount of federal budget funds for such investment projects in the context of a constant budget financing shortage and a large number of constituent entities of the Russian Federation (Bretschneider and Reterswärd, 2002; Siluanov et al., 2011) [6,7].

In addition, the results of calculating the effects for a region are necessary for considering the investment project at the level of governments of constituent entities of the Russian Federation. Since a large part of investment projects are implemented without involving constituent entities of the Russian Federation in any form, understanding the importance and necessity of such projects for the region's development reduces the time for its implementation due to the region's participation in resolving the issues within its competence (the speed of solving land issues; issues related to connection to power grids, etc.).

For this purpose, we suggest to use an economical and mathematical model for assessing the effects of implementing investments projects for the inland waterway transport infrastructure development on the social and economic indicators of constituent entities of the Russian Federation using the Difference-in-Differences method and an economic and mathematical model for probabilistic and quantitative assessment of the effects of implementing investment projects on the social and economic indicators of constituent entities of the Russian Federation using the Bayesian modelling.

It should be borne in mind that when implementing investment projects financed by the federal budget, federal executive authorities are responsible for solving sectoral issues of federal importance.

One example of such a sectoral issue of federal importance is the existence of limiting sections on inland waterways (Akaev et al., 2019; Stufflebeam et al., 2000) [8,9].

When solving this issue, the government of the Russian Federation does not consider an individual region with such a limiting section; it considers as a whole not only the inland waterway system, but also the transport system in general, taking into account the interconnection between modes of transport.

Nevertheless, the issue of assessing the impact of investment projects on the social and economic indicators of constituent entities of the Russian Federation is important for understanding the effects of such investment projects in the context of specific results, considering that the transport infrastructure itself is not a source of economic growth, but its natural limiting factor. At the same time, there is a significant problem requiring a methodological solution that is related to a feature of the transport industry, namely the existence of transit freight traffic.

E.g., if a constituent entity of the Russian Federation has no major consignors, the construction of a waterway hub to ensure the throughput of an inland waterway in the territory of such an entity will provide no significant direct economic benefits to the region.

Therefore, we need to conduct an assessment of the impact (actual or intended) of an investment project on the social and economic indicators of constituent entities of the Russian Federation 4, such as:

- Gross Regional Product;

- unemployment rate;

- Gini coefficient;

- amount of investments per capita;

- volume of fixed assets;

- shipment of mined minerals;

- shipment of the manufacturing sector products;

- labour productivity index;

- volume of exports.

It should be noted that all the above indicators of social and economic development of constituent entities of the Russian Federation, in general, are not specific efficiency and development indicators of the transport system; however, they are required to assess the impact of investment projects with state participation (Klimenko et al., 2016; Bukhvald et al., 2019). However, this assessment does not include indicators that directly characterize the transport system in general and the inland waterway transport in particular, namely, the fright traffic by modes of transport, the freight turnover, the average carriage time, the transport intensity of the economy, the length of paved roads, the length of railways, the length of inland waterways with the illuminated environment and with guaranteed depths of navigation, etc.

These indicators are directly assessed by the federal executive bodies when deciding to include an investment project into a draft state program of the Russian Federation to allocate budget funding; and they are included into industry policy documents, such as strategies, governmental programs, federal projects, and departmental target programs (Zaporozhan, 2016; Melnikova, 2019).

3. Model

The goal of our study is to determine the impact of investment projects financed from the federal budget on the social and economic indicators of the relevant region, as assessed by executive authorities of constituent entities of the Russian Federation.

In order to confirm the stated hypothesis about the positive impact of implementing investment projects on the social and economic indicators of constituent entities of the Russian Federation, we find it is necessary to carry out this assessment in two areas: assessing the impact of previously implemented investment projects and assessing the probability and level of impact of investment projects at the stage of their initiation.

To assess the impact of previously implemented investment projects, in this paper, we propose a model based on the difference-in-differences method (hereinafter referred to as DID) (Rubin, 1974; Bertrand et al., 2004; Abbring et al., 2004).

In this research, the experimental group is limited to the regions participating in the subprogram "Inland Waterway Transport" of the federal target program (FTP) "Development of the Transport System in Russia (in 2010-2021)". It should be noted, that FTP includes a large number of different investment projects aimed to maintain the depth of the waterway, to maintain the width of the road, to overcome thresholds, to repair and modernize locks, to purchase service vessels.

According to this method, the elements that have been absolutely randomly not affected, have been selected into the control group (Maddala et al, 1976; Minchenko, 2012; Tsygankov, 2009).

For the sake of objectivity in selecting initial data for calculations, the Subprogram does not include:

- unfinished projects under which, before 2018 (inclusive), only preparation of design and cost estimate documents was carried out;

- projects financed from extra-budgetary sources;

- projects implemented in the territory of several constituent entities of the Russian Federation (construction of a transport and service fleet, etc.) – due to the impossibility of its territorial distribution (a ship was built in the territory of one region, but it is operated in the territory of several regions, depending on the current tasks) (Tsygankov, 2009);

- projects implemented in the territory of Moscow, the Moscow Region, Saint Petersburg, and the Leningrad Region to obtain the most objective data, taking into account the specifics of these regions (a large number of other factors affecting socio-economic indicators, due to their status as centres of economic activity in the Russian Federation and metropolitan regions. These factors will not allow an objective assessment of the impact of investment projects in the field of inland waterway transport, including due to the cost of these projects);

- projects implemented in the territory of Sevastopol and the Republic of Crimea due to their inclusion in the Russian Federation after launching the Subprogram.

In addition, when compiling statistics, we have taken into account changes in the list of constituent entities of the Russian Federation upon segregation (exclusion) of federal districts from regions and territories (Shuvalov, 2008).

In view of the above, Table 3 shows the amounts of actual financing of investment projects under the IWWT Subprogram of the Federal Target Program for Transport System Development by constituent entities of the Russian Federation.

Table 3. Actual Financing of the Subprogram, in a million rubles

Region	Total	2010	2011	2012	2013	2014	2015	2016	2017	2021
Volgograd Region	9,076.5	837.4	803.6	224.4	192.7	1,169.4	994.3	1,079.6	1,550.0	2,225.1
Vologda Region	12,251.8	1,153.1	1,272.0	2,008.2	2,227.7	2,588.3	1,550.3	806.2	338.1	307.9
Kaliningrad Region	126.0		19.8	40.0	66.2					
Krasnoyarsk Territory	2,246.4	187.6	190.5	74.7	18.0	129.3	218.4	222.4	525.5	680.0
Nizhny Novgorod Region	6,334.7	461.3	417.0	562.4	1,056.8	740.7	314.2	780.9	981.4	1,020.0
Novosibirsk Region	2,999.9	393.2	306.9	373.0	95.2	201.9	422.3	378.8	337.6	491.0
Perm Territory	5,091.8	420.0	284.1	1,027.5	955.5	583.3	174.1	1.0	180.0	1,466.3
Republic of Karelia	8,789.7	498.3	791.8	2,059.1	1,462.2	916.1	1,463.7	865.6	277.1	455.8
Rostov Region	1,520.3	33.3	289.7	341.9	160.0	378.9	218.6	97.9		
Samara Region	252.5	252.5								
Saratov Region	92.8	92.8								
Khabarovsk Territory	41.5	41.5								
Total	**48,823.9**	**4,371.0**	**4,375.4**	**6,711.2**	**6,234.3**	**6,707.9**	**5,355.9**	**4,232.4**	**4,189.7**	**6,646.1**

Based on Table 3, we have created an experimental (test) group of regions (including those regions where investment projects of the Subprogram are implemented) and a control group of regions where investment projects were not implemented under the Subprogram (other regions were analyzed taking into account the exclusion of the above-listed regions).

Subject to the requirements of the mathematical research methods selected for the statistical sample scope, the study period is 2005-2018, that is, taking into account the period preceding the observed phenomena (the Subprogram implementation).

A graphical representation of the difference-in-differences method is shown in Figure 3, a program that is measured as the difference in the differences of the resulting variable: (P2 – S2) – (P1 – S1).

Figure 3. Graphical representation of the difference-in-difference method

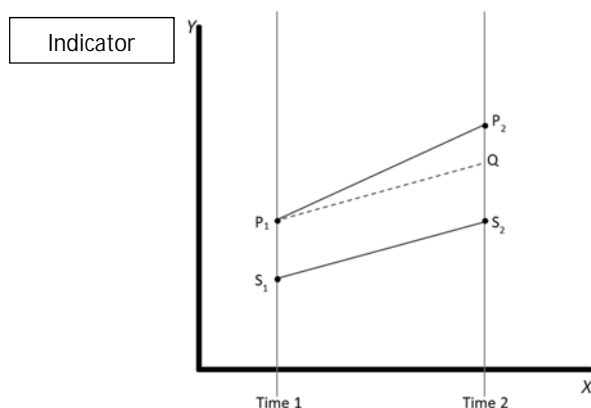

Table 4 shows this calculation.

Table 4. Calculation using the difference-in-difference method

Indicator	Experimental group			Control group			D3
	2005-2009	2010-2021	D1	2005-2009	2010-2021	D2	
GRP (log10)	5.1666	5.5134	0.3468	5.0646	5.4361	0.3715	**-0.0248**

In accordance with the provisions of the difference-in-differences method, based on the data obtained, we shall draw a conclusion about the negative impact of implementing investment projects on the increase in the Gross Regional Product.

In order to confirm the results obtained, the author carried out a calculation using special software (Stata, R).

Table 5 provides detailed data on the calculation, including the main statistical indicators.

Table 5. Calculating the impact coefficient of participation in the Subprogram on the GRP in the experimental group

GRP	Coef	Std. Err.	T	P>|t|	[95% Conf. Interval]	
Y2018	0.3715202	0.37659	9.87	0.000	0.2971014	0.4459391
Part	0.1020772	0.0670147	1.52	0.130	-0.030352	0.2345065
Y2018Part	-0.0247546	0.0947731	-0.26	0.794	-0.210379	0.1625286
_cons	5.064556	0.0266289	190.19	0.000	5.011934	5.117178

The positive value of the "Y2018" variable in the column of Coef., which is equal to 0.3715202, means that the values of the GRP indicator in general for all regions tended to grow during the study period.

The value of the "Part" variable in the column of Coef., that is equal to 0.1020772, means that the regions participating in the FTP also grew on average during the period under

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investigation, but their growth rates were noticeably lower than the average growth rates of all regions in general.

As we can see, the value of the "Y2018Part" variable coefficient, describing the impact of implementing investment projects on the GRP, are equal to the previous calculation results performed using aggregated means. That is, according to the data obtained, the very fact of a region's participation in the FTP is a negative factor in its social and economic development.

In the statistical analysis, one shall take into account the values of the verification coefficients that confirm the possibility of describing a model as corresponding to reality.

In this calculation, the F-test coefficient is equal to 0.000, which allows for further calculation of the determination coefficient.

According to the calculation made in a special software (Stata, R), the determination coefficient (R2) is equal to 0.44, which may mean that the resulting regression model explains only 44% of the average GRP growth in the regions of the experimental group, whereas 56% of GRP growth cannot be explained by the model (there are other factors).

The next stage in assessing the consistency of the resulting regression model is estimating the p-value coefficient (P>[t]), which is also a verification coefficient and shows the probability that the values of the variables are equal to zero.

In this calculation, the coefficients in both variables are above 0.1, which also proves the inconsistency of this model.

Given the above, we should supplement the model with other variables that affect the GRP indicator, with which the verification coefficient of determination is more than 0.50, as well as the value of the p-value coefficient (P> [t]) is less than 0.1.

4. Assessment of the Model for the Subprogram Impact on the GRP, Taking into Account Additional Variables

To build a regression model that meets the required statistical parameters (such as the determination coefficient), we added the variables to the above model.

Table 6 shows the results of the calculation performed in a special software (Stata, R) that allows to process large arrays of statistical data and to obtain the analysis results using the Difference-in-Differences method.

Table 6. Calculating the coefficient of the impact of social and economic development indicators on the GRP in the experimental group

GRP	Coef	Std. Err.	T	P>|t|	[95% Conf. Interval]	
Y2018	0.161681	0.201041	8.04	0.000	0.1219342	0.2014279
Un	-0.0095609	0.0171576	-0.56	0.578	-0.0434824	0.0243606
Gini	0.1828552	0.0890856	2.05	0.042	0.0067281	0.3589823
Inv	0.6795414	0.0374742	18.13	0.000	0.6054529	0.7536299
Assets	-0.1486371	0.037612	-4.00	0.000	-2.2221068	-0.0751674
Min	0.0330149	0.0093129	3.55	0.001	0.0146029	0.0514269
Ind	0.04811	0.020779	2.32	0.022	0.0070287	0.0891912
Labor	-0.5772923	1.046659	-0.55	0.582	-2.646594	1.49201
Exp	0.0737259	0.0145217	5.08	0.000	0.0450157	0.1024361
Part	0.0043522	0.024289	0.18	0.858	-0.0436684	0.0523728
Product of variables	-0.0000023	0.0000187	-0.12	0.902	-0.0000392	0.0000346
_cons	3.378419	2.092953	1.61	0.109	-0.7594611	7.5163

The explanation of the abbreviations in Table 6:

- Y2018 – Dummy is a variable indicating the period before or after the start of the implementation of the FTP;

- Un – the unemployment rate;

- Gini – the Gini coefficient;

- Inv – the amount of investments per capita;

- Assets – the volume of fixed assets;

- Min – the shipment of mined minerals;

- Ind – the shipment of the manufacturing sector products;

- Labor – the labour productivity index;

- Exp – the volume of exports;

- Part – dummy is a variable that characterizes the region's participation in the FTP.

By analogy with using a model without additional variables, before considering the calculation results, we shall assess the model consistency.

According to the method used, the first critical coefficient is the F-test coefficient equal to 0.000, which allows for further calculation of the determination coefficient.

In turn, the determination coefficient (R2) is equal to 0.9359, which may suggest that the resulting regression model explains 93.6% of the average GRP growth of the regions in the experimental groups, which is interpreted as the model consistency with real data and efficiently illustrates the functional dependence between the variables.

It is common to apply an additional adjusted factor – R2, which uses unbiased variance estimates.

In this calculation, the adjusted determination coefficient is equal to 0.9309, which allows us to consider the model as acceptable and proceed to further calculations.

The next stage in assessing the model consistency with real data is estimating the p-value coefficient (P>[t]).

We have highlighted the variables for which the p-value coefficient (P> [t]) is within the normal range (<0.1).

As other variables (Un and Labor) do not meet the requirements for the p-value coefficient, we shall exclude them from the assessment; Y2018 and Part are dummy variables; so, they are not taken into account in the calculation.

Therefore, we shall perform the calculation without taking into account the above variables (Un and Labor) and, if necessary, we will apply additional exceptions and carry out repeated calculations of the model.

The final calculation results are shown in Table 7.

The F-test coefficient is equal to 0.0000.

The determination coefficient is equal to 0.9237.

The adjusted determination coefficient is equal to 0.9199.

This means that the suggested model explains 92.0% of the change in the growth rate of the gross regional product.

Table 7. Calculating the Impact Coefficient of Social and Economic Development Indicators on the GRP in the Experimental Group, Taking into Account the Excluded Indicators

GRP	Coef	Std. Err.	T	P>|t|	[95% Conf. Interval]	
Y2018	0.1112283	0.0170477	6.52	0.000	0.0775323	0.1449243
Gini	0.2310515	0.0949181	2.43	0.016	0.0434388	0.4186643
Inv	0.7579541	0.0341505	22.19	0.000	0.69044531	0.8254551
Assets	-0.1464791	0.0389377	-3.76	0.000	-2.2234427	-0.069516
Min	0.0481767	0.0094522	5.10	0.000	0.0294937	0.0668598
Ind	0.1052007	0.0181092	5.81	0.000	0.0694065	0.140995
Part	0.0048244	0.035467	0.30	0.010	-0.0435528	0.0521285
Product of variable	0.0000086	0.0000817	0.11	0.099	-0.0001528	0.0001707
_cons	1.707307	0.1887575	9.04	0.000	1.334213	2.0804

In addition, all the suggested indicators meet the control parameter of the p-value coefficient (P> [t]): less than 0.1.

The value of the _cons variable, which is equal to 1.707307, describes the GRP growth, provided that the values of the variables used in the model are set to zero.

5. Results

Therefore, we can draw the following conclusions about the impact of the following social and economic indicators on changes in the growth rate of the gross regional product, these indicators being, in turn, affected by the implementation of investment projects included into the FTP:

- the Gini coefficient has a positive effect on GRP growth; in turn, the implementation of investment projects has a positive effect on improving the Gini coefficient;

- an increase in the amount of investments in fixed assets has a positive effect on the GRP growth; in turn, the implementation of investment projects has a positive effect on the growth of investment amount;

- an increase in the volume of fixed assets has a negative effect on GRP growth; in turn, the implementation of investment projects has a positive effect on the growth of fixed assets. Apparently, this pattern is explained by accumulating obsolete fixed assets that do not increase the added value of finished products;

- an increase in the shipment volume of mined minerals has a positive effect on the GRP growth; in turn, the implementation of investment projects has a positive effect on their shipment volume growth, creating opportunities for their transportation at a relatively low cost;

- an increase in the shipment volume of manufacturing industry products has a positive effect on the GRP growth; in turn, the implementation of investment projects has a positive effect on their shipment volume growth, creating opportunities for their transportation at a relatively low cost;

The total effect is positive (taking into account the negative effect of the increase in the value of fixed assets), but virtually insignificant: 0.0000086.

So, we obtained data on the impact of implementing the Subprogram "Inland Waterway Transport" of the FTP for the transport system development from its launch until 2018.

Therefore, we find it is necessary to use the Difference-in-Differences method to assess the effectiveness of investment projects for aggregated economic development indicators.

To assess the probability of the investment project's impact on the social and economic indicators of constituent entities of the Russian Federation at the stage of making a decision on their implementation, we need to carry out calculations based on the Bayesian modelling.

We have developed an economic and mathematical model for probabilistic and quantitative assessment of the effects from implementing investment projects on social and economic indicators of constituent entities of the Russian Federation using the Bayesian modelling (Meyer, 1995).

The use of the Bayesian modelling method to assess the probability of investment project impact on social and economic indicators of constituent entities of the Russian Federation

will allow, before making a decision on launching an investment project, to have an idea of its economic effects for the region (Florens et al., 1996; Sornn-Friese, 2003).

In accordance with the above-described Bayesian modelling method, we have calculated the probability of changes in social and economic indicators of constituent entities of the Russian Federation under the effect of implementing investment projects with state participation for the development of inland waterway transport infrastructure.

Table 8 shows the results of calculating the impact of the region's participation in the FTP on the social and economic indicators of the regional development.

Table 8. Calculating the Probability of the FTP Impact on Social and Economic Indicators

Dependent indicator	Median	Lower limit value	Upper limit value	Note
Gross Regional Product	9.2%	0.5%	18.0%	Positive effect
Unemployment rate	-6.7%	-15.5%	2.5%	Positive effect
Gini coefficient	-0.6%	-5.4%	4.4%	Positive effect
Amount of investments per capita	16.8%	7.5%	25.5%	Exceeding the deviation of control indicators
Volume of fixed assets	33.6%	28.5%	38.7%	Positive effect
Shipment of mined minerals	16.9%	-3.7%	36.6%	Positive effect
Shipment of manufacturing industry products	9.5%	1.2%	16.3%	Positive effect
Labor productivity index	1.6%	-3.7%	6.7%	Positive effect
Volume of exports	7.2%	-2.8%	16.9%	Positive effect

6. Conclusion

Therefore, we can conclude that implementing the FTP investment projects in a region will result with a probability of 95% in increasing the GRP of such a region within the range of 0.5% to 18.0% (the median posterior probability: 9.2%).

It should be noted that, in general, this result is consistent with the findings obtained through calculations using the Difference-in-Differences method.

Therefore, this paper assessed the impact of implementing an FTP investment project on the social and economic indicators of the constituent entity of the Russian Federation where such an investment project is implemented.

The data obtained in the course of this study can be used by federal executive authorities, executive authorities of constituent entities of the Russian Federation to assess the effectiveness of implementing an investment project when including it in a state program of the Russian Federation or that of a constituent entity of the Russian Federation.

This method can be used in relation to investment projects under other state programs, which allows us to draw a conclusion about its scientific, functional, and practical significance for the system of implementing governmental capital investments.

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FOREIGN DIRECT INVESTMENT IN THE QUEST FOR POVERTY REDUCTION IN NIGERIA[3]

This study examined the direct and indirect impact of foreign direct investment (FDI) on poverty reduction in Nigeria using the Autoregressive Distributed Lag (ARDL) framework for the period 1981-2019. The results of the study revealed that foreign direct investment exerted a significant positive effect on economic growth and economic growth, in turn, significantly contributes to poverty reduction within the period of review 1981-2019. This implies that FDI indirectly contributes to poverty reduction via economic growth. Regarding the direct impact of FDI on poverty reduction, the study shows that FDI significantly exerted an adverse effect on poverty via relatively low income and loss of jobs. Similarly, the study shows that wage and private-sector credit contribute to poverty reduction.
Keywords: Foreign Direct Investment; Poverty Reduction; Economic Growth; Nigeria; ARDL Framework
JEL: F21; F23; O10; O50

1. Introduction

Foreign direct investment (FDI) has been widely seen as a growth-enhancing factor in developing countries. It has the potential to augment the saving-investment gap in developing countries and comes with technology and managerial skills which set the pace for economic development, most importantly, poverty reduction. According to United Nations Conference on Trade and Development (UNCTAD, 2006), FDI has the potential to generate employment, raise productivity, transfer foreign skills and technology, enhance exports and contribute to the long-term economic development of developing countries.

In the 1960s, there was a huge foreign direct investment (FDI) inflow attraction into Nigeria. More than 25% of companies registered in Nigeria in 1956 were foreign-owned, while in 1963, as much as 70% of investment in the manufacturing sector was from foreign sources (Ohiorhenuan, 1990). However, there was a reduction in Nigeria's ability to attract and retain FDI due to policy design, decades of political instability, economic mismanagement, and

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endemic corruption. Also, the high level of deterioration of the country's social conditions and physical infrastructure compounded the fall in FDI inflows, despite increased public revenues generated by the oil sector. Consequently, over 70% of the population lived on less than one dollar a day (UNCTAD, 2009).

The return to democracy in 1999 created the opportunity for economic renewal and an associated broader base of FDI. To reap the benefits from FDI, the Nigerian government undertook critical measures to improve the investment climate. The aim is to provide an environment more conducive to domestic private investment and FDI. Thus, in May 1999, the reform process was set in motion, mainly through a home-grown poverty reduction strategy. On this note, the National Economic Empowerment and Development Strategy (NEEDS) was adopted in 2003 to guide public policies. In contrast with previous development plans, NEEDS made FDI attraction an explicit goal for the government as well as gave attention to drawing investment from wealthy Nigerians abroad. According to NEEDS, Nigeria would have to achieve 30% annual investment and 7 to 8% growth to successfully halve poverty by 2015, in line with the Millennium Development Goals. Since 2001, Nigeria has been the major recipient of FDI within the Economic Community of West African countries (ECOWAS) group and accounted for over 70% of the group inflows (UNCTAD, 2009). With the majority of FDI flowing into Nigeria, it is expected that jobs will be created, income raised and hundreds of millions lifted out of poverty while accelerating economic growth. Unfortunately, at present, despite the increased FDI inflows, Nigeria is off-track on meeting its poverty reduction target, as the poverty trend has continued to rise. According to the National Bureau of Statistics (NBS) (2019), 82.9 million (40.1%) Nigerians are classified as poor. In other words, on average, 4 out of 10 individuals in Nigeria have real per capita expenditures below ₦137,430 per year. This collaborates with Omoniyi (2013), who asserted that despite the government's poverty eradication campaigns, national development plans, and seasonal papers; poverty is still a major challenge in Nigeria.

Empirically, there have been conflicting results on the impact of FDI on poverty reduction. This has raised several questions in the minds of scholars and policymakers about the benefits of liberal policies that promote FDI inflows. The existing literature is divided between findings with a positive impact of FDI on poverty reduction, a negative one, and an insignificant impact of FDI on poverty reduction. For instance, Gohou & Soumare (2012), Fowowe & Shuaibu (2014), Uttama (2015), and Topalli et al.(2021) found a significant positive impact of FDI on poverty reduction, while Huang et al. (2010), Ali & Nishat (2010), and Agarwal et al. (2017) found a significant negative effect of FDI on poverty reduction. Also, Tsai & Huang (2007), Akinmulegun (2012), and Ogunniyi & Igberi (2014) asserted that there is an insignificant impact of FDI on poverty reduction. It is worthy of note that the existing literature on the FDI-poverty relationship, which is based on different countries, poverty proxies, and varied econometric approaches, failed to provide a conclusive result. Therefore, this study contributes to the examination of the direct and indirect impact of foreign direct investment on poverty reduction in Nigeria.

The rest of the paper is organized as follows. Following the introduction is the literature review, which is in section two, and section three deals with the method of analysis. Section four focuses on the empirical results and analysis of the data relating to FDI and inclusive growth in Nigeria, while section five deals with the concluding remark.

2. Literature Review

2.1. Impact of Foreign Direct Investment on Poverty

The impact of FDI on poverty alleviation could be indirect or direct effects.

2.1.1. Indirect Effect of FDI on Poverty Reduction

Given the positive influence of FDI on the host country's economic growth, the indirect effect of FDI on poverty depends on how economic growth affects poverty (World Bank 2000/2001). Empirical literature that has investigated the relationship between FDI and economic growth and how they have impacted poverty reduction revealed that economic growth is a channel through which FDI influences poverty reduction (Hanim, 2011). According to Klein et al. (2001), FDI is a medium through which economic growth improves the host country's welfare/poverty alleviation. Theoretically, this may occur through different channels. Firstly, economic growth may affect poverty through its impact on investment and employment. According to the flexible accelerator principle, on the supply side, an increase in the growth rate of output will lead to an increase in the level of investment, as well as employment. On the demand side, as the economy grows, there will be an increasing demand for existing goods and services or arising demand for new products (UNCTAD, 1999), thereby raising investment demand. Since investment and technology innovation are the main drives for employment and income, poverty reduction may be improved. Secondly, economic growth increases the government budget (income), which facilitates government spending on social programmes for the poor (Klein et al. 2000) and government investment in infrastructure, especially in poor areas. This shows that economic growth is one of the most important factors influencing poverty (World Bank, 2000/2001).

2.1.2. Direct Effect of FDI on Poverty Reduction

The impact of FDI on poverty also works by providing employment opportunities to the host country's workers. FDI under the mode of green-field investment may reduce existing unemployment by providing people with income and therefore reducing poverty. International Finance Corporation (IFC, 2000) considered this as a major impact of FDI on poverty. The green-field investment is an investment that relates to producing unique products without close substitutes in the host country. Contrarily, FDI may induce unemployment when it is under the mode of Merge and Acquisitions (M&A). When FDI takes the mode of M&A of moribund enterprises, it may help prevent potentially increased unemployment and, therefore, increase poverty. Similarly, FDI may induce indirect employment in local firms. FDI may raise employment in backwards-linkage entities (local firms) if the foreign investors use the local suppliers, subcontractors, and service providers and may also raise employment in forward-linkage entities when using local distributors (Hemmer & Phuong Hoa, 2002) and therefore improving poverty reduction. The reverse may be the case if foreign investors rely on imported inputs as well as foreign distributors.

2.2. Overview of FDI Inflows in Nigeria

Between the 1950s and 1960s, Nigeria attracted huge foreign direct investment (FDI) inflows. Ohiorhenuan (1990) asserted that more than 25% of companies registered in Nigeria in 1956 were foreign-owned, while in 1963, as much as 70% of investment in the manufacturing sector was from foreign sources. However, there was a reduction in FDI inflows into Nigeria due to policy design, decades of political instability, economic mismanagement, and endemic corruption. The reduction was also compounded by the high level of deterioration of the country's social conditions and physical infrastructure, despite increased public revenues generated by the oil sector (United Nations Conference on Trade and Development, UNCTAD, 2009).

In 1970, one year before Nigeria joined the Organization for the Petroleum Exporting Countries (OPEC), FDI inflows stood at $205 million. By 1975 it reached $470 million. After Nigerian National Petroleum Corporation's (NNPC) stake in Shell Nigeria and other oil companies reduced from 80 to 60%, which took place in 1989 (mergers and acquisitions), Nigeria's FDI inflows stood at below $1 billion. However, the restriction policies (indigenization policy) affected the FDI inflows in sector other than oil. This pushed most foreign investors to divest. In 1989, the indigenization policy was partially reversed. However, it was in 1995 that the National Investment Promotion Act opened virtually all areas of the economy to foreign investors (UNCTAD, 2009).

Between 1970 and the 1990s, Nigeria accounted for more than 30% of all FDI inflows to Africa. However, in 2007, Nigeria accounted for about 16 percent of all FDI inflows to Africa. Similarly, in the 1970s, Nigeria attracted about half the FDI inflows into the Economic Community of West African countries (ECOWAS) group. Since 2001, Nigeria has been the major recipient of FDI within the group and accounted for over 70% of the group inflows. In Africa, in terms of absolute FDI stock, Nigeria remains the second largest recipient after South Africa, with $63 billion and $93 billion, respectively (UNCTAD, 2009).

In 2019, Nigeria attracted the third-largest foreign direct investment (FDI) inflows in Africa after Egypt ($9 billion) and the Democratic Republic of the Congo ($3.4 billion) received more inward FDI as FDI inflows across the whole African continent fell by 10.3% ($45.4 billion), but it suffered a sharp yearly decline in inward investment. Data from the United Nations Conference on Trade and Development (UNCTAD) reveals that Nigeria received $3.3 billion of FDI inflows in 2019, with a yearly decline of 48.5%. Despite the decline in FDI inflows in 2019, Nigeria's FDI stock has grown between 2017-2019 to reach $98.6 billion in 2019. The number and value of green-field investments have been on the increase, steadily growing from 36 projects worth $4.8 billion in 2017 to reach 76 projects worth $10.2 billion in 2019 (UNCTAD, 2009).

In the same way, as shown in figure 1, there are indications that FDI has been positively fluctuating between 1981-2019. Between 1990 and 1995, there was a sharp rise in FDI as a percentage of GDP and later fell in 1998; thereafter, it rose in 1999.

Figure 1: Foreign Direct Investment Inflows (% of GDP), 1981-2019
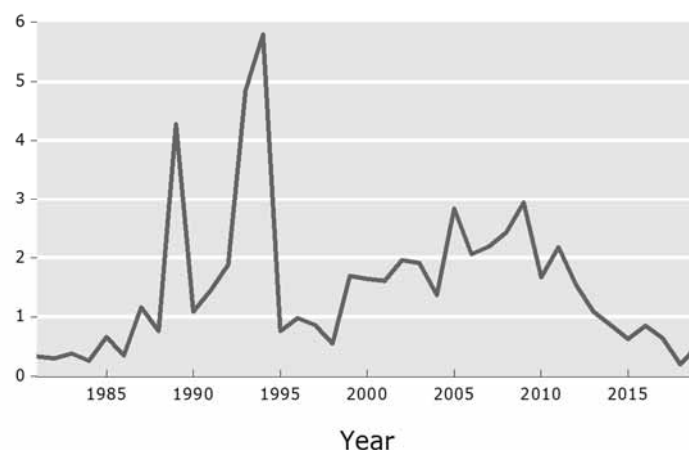
In 2003, Nigeria underperformed in attracting FDI outside the oil sector. Only 18 of the top 100 world's largest non-oil transnational corporations (TNCs) had affiliates in Nigeria, compared with 42 in South Africa, 25 in Egypt, and 17 in Kenya. A total of 41 of the top 100 were present in at least one of these countries but not in Nigeria. These 41 TNCs represent a wide range of sectors, with pharmaceuticals and motor vehicles prominent (UNCTAD, 2005). This underperformance could be attributed to insecurity and instability as well as poor business perceptions. This is evident in the Economic Forum's index of business perceptions of costs of crime and violence which ranked Nigeria 120th of 130 countries in 2007.

2.3. Empirical Review

2.3.1. FDI and Economic Growth

The endogenous growth theories placed much emphasis on technological innovation and research and development as major sources of economic growth. As posited by the endogenous growth models, the growth rate of a country depends on the state of the technology applied. The foreign firms are seen by Ford et al. (2008) as the major sources of technological innovation and research and development in developing countries through their direct investment. Borensztein et al. (1998) assert that the advanced technologies provided by foreign firms stimulate the economic growth of developing countries.

Insah (2013), Iqbal & Abbas (2015), Agrawal (2015), and Bouchoucha & Ali (2019) investigated the impact of FDI on economic growth using various techniques and found that FDI has a significant positive effect on growth. Apergis, Lyroudi, & Vamvakidis (2008) investigated the effect of FDI on economic growth, using panel data from 27 transitional European economies and came to the conclusion that FDI improves economic growth in transitional economies with a high level of incomes and efficient privatization schemes.

Chowdhury & Mavrotas (2006) used Toda Yamamoto technique to analyze the direction of causality between FDI and GDP growth for Thailand, Chile, and Malaysia. Their findings show that for Chile, GDP growth caused FDI net inflows and not the opposite. In contrast, the findings for Thailand and Malaysia show strong evidence of a bi-directional causality between GDP growth and FDI inflows. Hemmer & Phuong Hoa (2002) used panel data covering 61 provinces of Vietnam and the 1990-2000 period to investigate the impact of FDI on economic growth, and they found that FDI has a positive and significant impact on growth. Olusanya (2013) used a Granger causality test to examine the impact of FDI on economic growth in a pre and post-deregulated Nigerian economy from 1970-2010. The result shows that in the pre-deregulation era (1970-1986) economic growth causes FDI, but in the post-deregulation era (1986-2010), the result shows that there is no causality between economic growth (GDP) causes FDI. However, between 1970 and 2010, the result shows that economic growth drives foreign direct investment inflow into the country. Furthermore, Mencinger (2003) examined the impact of FDI on economic growth in eight Central and Eastern European Countries and found a negative correlation between FDI and economic growth. From these studies, it is revealed that the impact of FDI on growth is either negative or positive or non-significant.

2.3.2. FDI and Poverty Reduction

Gohou & Soumare (2012), with panel data and controlling for endogeneity, used the 2-stage least square regression to analyze the impact of FDI on poverty in a sample of 52 African countries between 1990 and 2007. In their study, they used HDI and GDP per capita as proxies for poverty and their result revealed a strong and significant positive relationship between FDI and poverty reduction – with respect to both measures of poverty. Similarly, in a sample of five African free trade areas, which constitute five custom unions and monetary unions, their result showed that the impact of FDI on poverty was significantly different among African regions. FDI was found to have a positive and significant impact on poverty reduction in Central and East Africa. These results are consistent with Fowowe and Shuaibu (2014), that used Generalized Methods of Moments (GMM) to examine the effect of FDI on the poor in a sample of 30 African countries with pooled data from 1981 to 2011. In their study, the World Bank poverty headcount was used as a proxy for poverty, and they found that FDI is significantly good for the poor. Their analysis showed that the positive impact of FDI on poverty reduction was found to be high in poor countries with a high incidence of poverty. In the case of Nigeria, Anigbogu et al. (2016) used Ordinary Least Square to investigate the effect of foreign direct investment on poverty reduction in Nigeria from 1980-2014, and their findings show that FDI inflows significantly improved poverty reduction in Nigeria. The Absolute number of poor people living under the poverty line was used as a proxy for poverty reduction.

Mahmood & Chaudhary (2012), using Autoregressive Distributed Lag (ARDL) approach, investigated the effect of FDI on poverty reduction in Pakistan between 1973 and 2003. The poverty headcount was used as a proxy for poverty. Based on their analysis, FDI was found to have significantly reduced poverty in Pakistan. This result is in line with Shamim et al. (2014) and Fowowe & Shuaibu (2014), that also examined the impact of FDI on poverty in Pakistan from 1973 to 2011 using poverty headcount as a proxy for poverty. Furthermore,

Uttama (2015), using a spatial panel data model and spatial data from 1995 to 2011, investigated the determinants of FDI and other related factors in the ASEAN countries. The result revealed that a positive and significant relationship exists between FDI and poverty reduction in the sample countries. Hemmer & Phuong Hoa (2002), based on panel data covering 61 provinces of Vietnam and the 1990-2000 period, investigated the impact of FDI, and economic growth on poverty reduction in Vietnam using a pooled regression. The poverty headcount was used as a proxy for poverty. The result shows that the direct impact of FDI works through employment creation, but the impact was negatively insignificant, while the FDI's indirect impact through economic growth exerts a negative and significant effect on the rate of poverty. This implies that FDI significantly impacted on poverty indirectly in Vietnam while the direct effect remains insignificant. Topalli et al. (2021) investigated the impact of FDI inflows on poverty reduction in six Western Balkan countries and also considered other country characteristics using a generalized method of moments (GMM) estimator for panel data models with fixed effects during the period from 2002 to 2021. The poverty headcount was used as a proxy for poverty. Their results show that FDI significantly contributed to poverty reduction in the Western Balkan countries.

Huang et al. (2010) found that FDI has a significant negative impact on poverty reduction in their analysis of the effect of FDI on poverty reduction in 12 countries in East and Latin America between 1970 and 2005 using unbalanced panel data. The mean income of the poorest quintile of the population was used as proxy poverty. This result is in line with Ali et al. (2010) that found FDI inflows have a negative impact on poverty reduction in Pakistan in both the short and long run in their investigation of the relationship between FDI and poverty reduction using Autoregressive Distributed Lag (ARDL). They measured poverty using poverty headcount. Similarly, Remla (2012), using Cointegration and Vector Error Correction approaches, investigated the effect of FDI and poverty reduction in Ethiopia from 1970-2009. The result reveals that real per capita GDP responded negatively to FDI in the long run. Real per capita GDP was used as a proxy for poverty. Furthermore, Agarwal et al. (2017), found that FDI has a negative and significant impact on poverty reduction in India using data from 1981-2011, while FDI has a positive and significant effect on poverty reduction in Nepal and Sri Lanka. This shows that poverty reduction has deteriorated.

Tsai & Huang (2007), using time series data from 1964 to 2003, examined the effect of inward FDI on poverty reduction in Taiwan and the study reveals that FDI has an insignificant impact on the average income of the poor. In the study, the mean income of the bottom quintile was used as a proxy for poverty. Gohou & Soumare (2012), found that FDI's impact on poverty reduction is insignificant in the Southern and Northern regions of Africa in their investigation of the impact of FDI on poverty in a sample of 52 African countries between 1990 and 2007 using panel data and two-stage least square regression method. The Human Development Index and Gross Domestic Product per capita were used as proxies for poverty. In Nigeria, Ogunniyi & Igberi (2014), using the Ordinary Least Squares, investigated the relationship between FDI and poverty reduction in Nigeria between 1980 and 2012 and they found an insignificant relationship between FDI and poverty reduction in Nigeria. In his own part, Akinmulegun (2012), using the Vector Autoregression method, examined the effect of FDI on welfare in Nigeria, using data from 1986 to 2009, and found a similar result to Ogunniyi & Igberi (2014).

The literature reviewed shows mixed results on the relationship between FDI on poverty reduction. Some scholars (Uttama, 2015; Topalli et al., 2021) have found FDI to reduce poverty, while others (Ali et al., 2010; Agarwal et al., 2017) have found FDI to worsen poverty. Also, another set of scholars (Akinmulegun, 2012; Ogunniyi & Igberi, 2014) found FDI to have an insignificant impact on poverty reduction. Many techniques, different proxy variables for poverty, different sample sizes, and time-frames were used in analyzing the effect of FDI on poverty reduction in the previous studies. Furthermore, many of the studies (such as Akinmulegun, 2012; Ogunniyi, Igberi, 2014; Topalli et al., 2021) focused on the direct impact of FDI on poverty reduction, while other studies (Hemmer & Phuong Hoa, 2002) looked out the indirect and direct channels through which FDI influence poverty reduction. These conflicting results have raised a number of questions in the minds of scholars and policymakers about the benefits of FDI inflows. Therefore, it becomes imperative to examine the channels through which foreign direct investment impacts poverty reduction in Nigeria, thereby contributing to the existing literature.

3. Method of Analysis

3.1. Data and Sources

The data for this study were sourced from the *World Bank's PovcalNet database, macrotrends.net, the World Bank's World Development Indicators (WDI), and the Central Bank of Nigeria Statistical Bulletin.* The data covered the period 1981-2019. In investigating the effect of FDI on poverty reduction in Nigeria, the study adopted Hemmer & Phuong Hoa (2002) approach, but with modification. This study differs from Hemmer & Phuong Hoa (2002) in the area of variables, types of data, and place. Hemmer & Phuong Hoa (2002) focused on Vietnamese provinces, while this study focuses on FDI and poverty in Nigeria. To measure poverty, this study followed Hemmer & Phuong Hoa (2002) by using the headcount index, which measures the percentage of the population living on less than US$ 1.90 per day at 2011 PPP term. Also, Hemmer & Phuong Hoa (2002) used a panel data in their analysis, while this study uses time-series data. In modelling the relationship between FDI and poverty reduction, Hemmer & Phuong Hoa (2002) modelled the relationship between FDI and poverty reduction indirectly and directly, using endogenous and simple models, respectively. In terms of analysis, Hemmer & Phuong Hoa (2002) used panel data pooled regression and therefore applied the cross-section weighting and white covariance estimation methods to correct for between-section and within-section heteroskedasticity while this study models the relationship between FDI and poverty reduction indirectly and directly using time series data and Autoregressive Distributed Lag (ARDL) framework.

Analytically, the ARDL approach is adopted over other approaches, such as Johansen & Juselius (1990), because it is relatively more appropriate and efficient for a small sample size (< 100). Secondly, irrespective of whether the underlying variables are I(0) or I(1), or a combination of both, the ARDL approach can still be applied. Also, endogeneity is less of a problem, since each of the underlying variables stands as a single equation (Nkoro & Uko, 2016).

The base estimation models are given as:

FDI and Economic Growth Model

The objective of this model is to explore the impact of FDI on economic growth.

$$LnEGRt = \beta0 + \beta1LnFDIt + \beta2LnGDinvt + \beta3LnHCSt + \beta4LnTOTt + \mu t \qquad (1)$$

Where LnEGR is the log of annual GDP growth rate, LnFDI is the log of the ratio of foreign direct investment to GDP. LnGDinv is the log of the ratio of adjusted gross fixed capital formation to GDP, which is used as a proxy for gross domestic investment. The adjusted gross fixed capital formation is arrived at by subtracting FDI from the total gross fixed capital formation. LnHCS is the log of the ratio of social capital expenditure to GDP, which captures human capital stock, and LnTOT measures the trade openness, while μ_t is the random error term, which is assumed to be randomly and independently distributed. Equation one is transformed into ARDL model.

The ARDL model approach to cointegration testing is:

$$
\begin{aligned}
\Delta LnEGRt = {} & \beta0 + \beta1LnEGRt - 1 + \beta2LFDIt - 1 + \beta3LnGDinvt - 1 + \beta4LnHSCt - 1 \\
& + \beta5LnTOTt - 1 + \sum_{k=1}^{k} \beta6\Delta LnEGRt - 1 + \sum_{k=0}^{k} \beta7\Delta LnFDIt - 1 \\
& + \sum_{k=0}^{k} \beta8\Delta LnGDinvt - 1 + \sum_{k=0}^{k} \beta9\Delta LnHCSt - 1 + \sum_{k=0}^{k} \beta10LnTOTt - 1 + \mu t
\end{aligned}
\qquad (2)
$$

Economic Growth, FDI and Poverty Reduction Model

Given the empirical postulation of the FDI-Economic growth relationship, as well as the growth impact on poverty, model 3 focuses on the channel through which FDI influences poverty reduction. This means that model 3 examines the growth impact (FDI's indirect impact) and, FDI's direct impact (employment impact) on poverty reduction in Nigeria. Thus:

$$LnPOVt = \psi0 + \psi1LnEGRt + \psi2LnFDIt + \psi3LnWt + \psi4LnPSCt + \varepsilon t \qquad (3)$$

Where LnPOV is the log of headcount, which measures the percentage of the population living on less than US\$ 1.90 per day at 2011 PPP term. LnEGR is the log of the annual GDP growth rate. LnFDI denotes the log of the ratio of foreign direct investment to GDP. LnW is the ratio of employees' compensation to GDP, which captures wages, and LnPSC is the ratio of private sector credit to GDP, while ε_t is the random error term, which is assumed to be randomly and independently distributed. Equation 3 is transformed into ARDL model.

The ARDL model approach to cointegration testing is:

$$
\begin{aligned}
\Delta LnPOVt = {} & \psi0 + \psi1LnPOVt - 1 + \psi2LnEGRt - 1 + \psi3LnFDIt - 1 + \psi4LnWt - 1 \\
& + \psi5LnPSCt - 1 + \sum_{k=1}^{k} \psi6\Delta LnPOVt - 1 + \sum_{k=0}^{k} \psi7\Delta LnEGRt - 1 \\
& + \sum_{k=0}^{k} \psi8\Delta LnFDIt - 1 + \sum_{k=0}^{k} \psi9\Delta LnWt - 1 + \sum_{k=0}^{k} \psi10\Delta LnPSCt - 1 + \varepsilon t
\end{aligned}
\qquad (4)
$$

Before estimating the models, the properties of the variables were examined to avoid order two integration, I(2), and to confirm the long-run relationship between the underlying variables. In the case of the unit root, the Augmented Dickey-Fuller (ADF) was used to test the order of integration of each variable. To test the hypothesis of no long-run relationship between FDI and the underlying variables, we imposed zero restriction on the coefficients of the one-period lagged-level (lag 1) variables in the unrestricted error correction models (UECM) (equations 2 and 4) and a joint significance test was carried out on the one-period lagged-level (lag 1) variables in equations 2 and 4. The long-run relationship tests followed the bound test procedure, which is based on F-statistic. If the F-statistic of the restricted coefficients falls above the Pesaran et al. (2001) upper bound critical value, reject the null hypothesis on no long-run relationship and vice versa.

4. Results and Discussion

4.1. Unit Root Test

Table 1 reveals the result of the Augmented Dickey-Fuller (ADF). All the variables are stationary at order I(1) except LnEGR, which is stationary at order I(0). Hence, the long-run relationship among the variables in equations 1 and 3 was examined using ARDL bound cointegration test.

Table 1

The ADF Unit Root Test Result

Variable	Constant/Trend	Level	First Difference	Order of Integration
LnEGR	Constant	-4.158068*	-	I(0)
LnFDI	Constant and Trend	-	-7.960562*	I(1)
LnGDinv	Constant and Trend	-	-4.955784*	I(1)
LnHSC	Constant	-	-11.63772*	I(1)
LnTOT	Constant and Trend	-	-6.729668*	I(1)
LnPOV	Constant and Trend	-	-3.843890**	I(1)
LnW	Constant and Trend	-	-8.465748*	I(1)
LnPSC	Constant and Trend	-	-4.095089**	I(1)

Note: *, ** and *** indicate significant at the 1 percent, 5 percent and 10 percent level of significance, respectively.
Source: Author's Computation.

4.2. ARDL Cointegration Bounds Test

In testing the hypothesis of no long-run relationship between FDI and the underlying variables, first, the ordinary least squares (OLS) method was used to estimate equations 2 and 4 and the results of the unrestricted error correction models (UECM) are presented in Tables 2 and 3. As indicated in panel B, Tables 2 and 3, the estimated UECM scaled through the post-estimation tests such as Breusch-Godfrey Serial Correlation LM test, ARCH test, the Ramsey RESET test, and the stability test. After which a zero restriction was imposed on the coefficients of the one-period lagged-level (lag 1) variables in equations 2 and 4, and joint significant tests were carried out. The results of the joint significant tests as shown in Table 4 are the long-run cointegration of the variables. The long-run relationship tests followed the bounds test procedure, which is based on F-statistic. Since the sample size is small (<100

observations), the study employed the critical bounds values provided by Narayan (2005) as against the critical values provided by Pesaran et al. (2001).

FDI Impact on Economic Growth in Nigeria

Table 2

Impact of FDI on Economic Growth in Nigeria, 1981-2019

Panel A

Dependent Variable: D(LNEGR)
Method: Least Squares
Sample (Adjusted): 1987 2019
Included observations: 25 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	21.38179	4.024428	5.313002	0.0130
LNEGR(-1)	-2.683815	0.281358	-9.538800	0.0024
LNFDI(-1)	2.486775	0.564419	4.405901	0.0217
LNGDinv(-1)	-7.220310	0.960380	-7.518177	0.0049
LNEDU(-1)	3.798308	0.621380	6.112702	0.0088
LNTO(-1)	-0.471231	0.457075	-1.030971	0.3784
D(LNEGR(-1))	0.726215	0.143363	5.065581	0.0149
D(LNFDI)	2.989070	0.395330	7.560944	0.0048
D(LNFDI(-1))	1.097910	0.253323	4.334038	0.0227
D(LNFDI(-2))	1.202180	0.279139	4.306750	0.0230
D(LNFDI(-3))	1.433479	0.179955	7.965781	0.0041
D(LnGDinv)	-1.670771	0.546702	-3.056088	0.0552
D(LNGDinv(-1))	6.696467	1.173835	5.704776	0.0107
D(LNGDinv(-2))	1.864790	0.854091	2.183362	0.1170
D(LNGDinv(-3))	-2.877795	0.810015	-3.552769	0.0380
D(LNEDU)	0.471975	0.189711	2.487862	0.0887
D(LNEDU(-1))	-2.712274	0.484839	-5.594171	0.0113
D(LNEDU(-2))	-1.439954	0.293036	-4.913906	0.0161
D(LNEDU(-3))	-0.950500	0.231987	-4.097206	0.0263
D(LNTOT)	-2.409114	0.449710	-5.357039	0.0127
D(LNTOT(-1))	-0.485154	0.280578	-1.729123	0.1822
D(LNTOT(-2))	-1.466966	0.309595	-4.738341	0.0178

R-squared		0.997919	Mean dependent Var	0.174646
Adjusted R-squared		0.983352	S.D. dependent Var	1.431839
S.E. of regression		0.184745	Akaike info criterion	-0.899949
Sum squared resid		0.102392	Schwarz Criterion	0.172661
Log likelihood		33.24937	Hannan-Quinn Criter.	-0.602453
F-statistic		68.50663	Durbin-Watson Stat	2.463076
Prob(F-statistic)		0.002486		

Panel B

Post Estimation Tests

Breusch-Godfrey Serial Correlation LM Test	F- Stat 3.226[0.214]
ARCH Test	F- Stat 0.001[0.974]
Ramsey RESET Test	F- Stat 8.380[0.102]

Panel C

Coefficient Restrictions Test/Bound Test

F-statistic	42.776 [0.0000]

Note: The LM test for serial correlation, ARCH test for heteroscedasticity, RESET test for functional form and CUSUM and CUSUMSQ for structural stability.The Breusch-Godfrey LM-test, ARCH test, and RESET test are based on F-statistics.

Source: Author's Computation.

Economic Growth and FDI Impact on Poverty Reduction in Nigeria

Table 3

Economic Growth and FDI Impact on Poverty Reduction in Nigeria

Panel A

Dependent Variable: D(LNPHC)
Method: Least Squares
Sample (Adjusted): 1986 2019
Included observations: 28 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.478677	0.110562	4.329475	0.0005
LNPHC(-1)	-0.123320	0.025228	-4.888124	0.0001
LNEGR(-1)	-0.007457	0.002697	-2.764604	0.0133
LNFDI(-1)	0.019539	0.003333	5.862701	0.0000
LNW(-1)	-0.028934	0.004778	-6.056036	0.0000
LNPSC(-1)	-0.072930	0.011439	-6.375722	0.0000
D(LNEGR)	-0.003704	0.001805	-2.051442	0.0560
D(LNFDI)	0.015629	0.003771	4.144932	0.0007
D(LNW)	-0.010340	0.005653	-1.829113	0.0850
D(LNPSC(-1))	0.045858	0.011015	4.163288	0.0007
D(LNPSC(-2))	0.067625	0.012881	5.249923	0.0001
R-squared		0.888889	Mean dependent Var	-0.011009
Adjusted R-squared		0.823530	S.D. dependent Var	0.019924
S.E. of regression		0.008370	Akaike info criterion	-6.441668
Sum squared resid		0.001191	Schwarz Criterion	-5.918302
Log likelihood		101.1834	Hannan-Quinn Criter.	-6.281670
F-statistic		13.60005	Durbin-Watson Stat	2.240275
Prob(F-statistic)		0.000003		

Panel B

Post Estimation Tests

Breusch-Godfrey Serial Correlation LM Test	F- Stat 1.106[0.357]
ARCH Test	F- Stat 0.031[0.862]
Ramsey RESET Test	F- Stat 2.209[0.157]

Panel C

Coefficient Restrictions Test/Bound Test

F-statistic	24.938 [0.0000]

Note: The LM test for serial correlation, ARCH test for heteroscedasticity, RESET test for functional form and CUSUM and CUSUMSQ for structural stability. The Breusch-Godfrey LM-test, ARCH test, and RESET test are based on F-statistics.

Source: Author's Computation.

The results in Table 4 reveal that there is a long-run relationship among the variables in the models, given that the F- statistics of the restricted coefficients fall above the upper bound critical value provided by Narayan (2005). Hence, the hypothesis of no long-run relationship between FDI and the underlying variables is rejected at the one percent level of significance. The results of the long-run models (of equations 1 and 3) are derived by normalizing the estimates of the cointegrating equations. The short and long-run estimates of the cointegrating equations are presented in Tables 5 and 6.

Table 4

ARDL Cointegration Bound Test

Model	F- Statistics	
Panel A: LnEGR = f(LnFDI, LNGDinv, LnHCS, LnTOT)	F- Stat = 42.776*	
Narayan (2005)	k = 4, n=40	
Critical Value	Lower Bound	Upper Bound
1%	4.428	6.250
5%	3.202	4.544
10%	2.660	3.838
Panel B: LnPOV = f(LnEGR, LnFDI, LnW, LnPSC)	F- Stat = 24.938*	
Narayan (2005)	k = 4, n=40	
Critical Value	Lower Bound	Upper Bound
1%	4.428	6.250
5%	3.202	4.544
10%	2.660	3.838

Notes: *, **, and *** denote significance at 10%, 5%, and 1% levels, respectively. Critical values are obtained from Narayan (2005).

Source: Author's Computation.

According to Khan (2007), to derive the short-run coefficients from UECM (Tables 2 and 3), the significant values of the lagged differenced coefficients of each variable are summed up, while the long-run coefficients are derived through the normalization of the coefficients of lagged-level variables by the dependent variable. Therefore, the short and long-run results of FDI impacts on economic growth, and economic growth and FDI impact on poverty reduction are presented in Tables 5 and 6, respectively.

Table 5

Short and Long-Run Coefficients of FDI Impact on Economic Growth in **Nigeria**

Variable	Panel A	Panel B
	Short Run Coefficients	Long Run Coefficients
Constant	21.382**	-
LnFDI	3.734**	2.487*
LnGDinv	2.148**	-7.220*
LnHCS	-4.631**	3.798*
LnTOT	-3.876**	-0.471

Note: *, ** and *** indicate significance at the 1 percent, 5 percent, and 10 percent level of significance, respectively. The long-run coefficients are derived through the normalization of coefficients of lagged level variables by dependent variable from equation 2. The short-run is derived by summing the significant values of the lagged differenced coefficients of each variable from equation 2.

Source: Author's Computation.

Table 5, the result reveals that FDI has a significant positive impact on economic growth in the short and long run. This implies that FDI inflows significantly contributed to increasing economic growth in Nigeria. That is FDI is a major source of economic growth in Nigeria through its spillover effects which stimulate productivity. This finding supports Apergis, Lyroudi, & Vamvakidis (2008); Hemmer & Phuong Hoa (2002) Agrawal (2015), Bouchoucha & Ali (2019) but contradicts Olusanya (2013), Mencinger (2003). The gross domestic investment exerts positive and negative impacts on economic growth in the short and long-run, respectively. The long-run negative impact of a gross domestic investment may be due to a lack of sustenance of existing infrastructure, which in turn may have contributed to a fall in productivity. This effect, to an extent, is a reflection of the high level of

infrastructural decay and neglect in the country. Also, the presence of multinationals may have crowded out domestic investment, in the long run, thereby affecting the impact of domestic investment. Human capital stock has significant negative and positive effects on economic growth in the short and long run, respectively. The short-run negative effect of human capital stock on economic growth may be attributed to the time lag between investment in human capital and productivity. As posited by growth theory, human capital is a long-run economic growth determinant. Trade openness exerts a significant and non-significant negative influence on economic growth in the short and long run, respectively. These negative effects of trade on growth may be due to over-dependence on imports. Also, this could be attributed to the fact that Nigeria's exports are mainly natural resources or raw materials (crude oil and agricultural products), which are less competitive.

Based on the significant positive impact of FDI on growth, the economic growth impact, as well as the FDI's direct impact on poverty reduction, were examined, and the results are presented in Table 6.

Table 6

Short and Long-Run Coefficients of Economic Growth and FDI impact on Poverty Reduction

Variable	Panel A Short Run Coefficients	Panel B Long Run Coefficients
Constant	0.479*	-
LnEGR	-0.004***	-0.007**
LnFDI	0.016*	0.020*
LnW	-0.010*	-0.029*
LnPSC	0.113*	-0.073*

Note: *, ** and *** indicate significance at the 1 percent, 5 percent, and 10 percent level of significance, respectively. The long-run coefficients are derived through the normalization of coefficients of lagged-level variables by the dependent variable from equation 2. The short-run is derived by summing the significant values of the lagged differenced coefficients of each variable from equation 2.

Source: Author's Computation.

Table 6, the result shows that economic growth has a significant negative impact on the rate of poverty in the short and long run. This growth-poverty relation represents FDI's indirect effect on poverty through capital formation, thereby raising economic growth. This result implies that FDI exerts a significant positive impact on economic growth and economic growth, in turn, brings about a fall in poverty headcount in Nigeria. Thus, FDI reduces poverty indirectly through economic growth in Nigeria. This result is in line with Hemmer & Phuong Hoa (2002), Topalli et al. (2021). Wage exerts a significant negative impact on poverty in the short and long run. This implies that a wage increase will bring about a fall in the rate of poverty. Thus wage plays a significant role in poverty reduction in Nigeria. Private sector credit has a significant positive and negative effect on poverty in the short and long run, respectively. The positive impact of private sector credit may be attributed to the low level of financial sector development in Nigeria in the 1980s. This may have lowered the private sector credit allocation in the short run, thereby increasing the level of poverty. The lower the level of financial sector services to the poor the higher the level of poverty. However, in the long run, a higher level of financial sector development brings about a fall in the poverty level. This is evident in the result of Table 6. Foreign direct investment has a

significant positive impact on the rate of poverty both in the short and long run. This FDI-poverty relation represents FDI's direct effect on poverty which is expected to work through employment creation in the local entities. However, the result shows that FDI directly raised unemployment which in turn increased the rate of poverty in Nigeria. This result is in line with Huang et al. (2010), Ali and Nishat (2010), but contradicts Shamim *et al.* (2014). Fowowe & Shuaibu (2014), Anigbogu, et al. (2016), Topalli et al. (2021). This adverse effect of FDI on poverty may be due to the excessive unskilled labour in Nigeria, given that most of the FDIs are capital intensive, thereby inducing low relative income. In this case, foreign enterprises provide the unskilled workers with income that would not have been accepted by many of them or income that remains unchanged and eroded as the local enterprises compete with foreign enterprises, while the income of the skilled labour increases because of its limited supply. With this, FDI will have an adverse effect on employment as well as the poverty level. This result could also be attributed to foreign enterprises relying more on imported inputs and foreign distributors and service agents in the production and distribution of their goods and services rather than using the backward and forward linkage entities (local entities). This may imply that foreign firms are not implementing the local content requirement law. Furthermore, this may be attributed to the fact that foreign enterprises outcompete local enterprises with their advanced technologies as against local enterprises labour intensive. This is evident in Nigeria's construction sector, where foreign enterprises are outcompeting local enterprises. In this case, workers are laid off and the rate of poverty deteriorates. The implication of this is that the more the foreign enterprises neglect or outcompete the local entities the higher the rate of unemployment and this, in turn, leads to an increase in poverty.

5. Concluding Remarks

This study examined the channels through which foreign direct investment (FDI) inflows impact on poverty reduction in Nigeria over the period 1981-2019. The poverty headcount was used as a proxy for poverty. Analytically, the ordinary least squares (OLS) method was used to estimate the Autoregressive Distributed Lag (ARDL) model. To validate the efficiency of the parameter outcomes, post-estimation tests such as: the Breusch-Godfrey Serial Correlation LM test, ARCH test, the Ramsey RESET test and CUSUM were carried out. Based on the analysis, the study found:

- That FDI significantly improved economic growth and economic growth, in turn, significantly enhanced poverty reduction in Nigeria. This implies that FDI indirectly contributes to poverty reduction via economic growth in Nigeria. The advanced technologies provided by foreign enterprises in Nigeria bridged the investment gap, thereby stimulating economic growth.

- That the direct impact of FDI is adverse on employment and poverty. This is because of the relatively low income of the excessive unskilled workers and the outcompeting of local enterprises.

- The estimated models scaled through the post-estimation tests. This implies that the models are efficient and the estimates are reliable.

Therefore, the study concludes that the FDI indirectly contributes to poverty reduction in Nigeria through its significant impact on economic growth.

Given the foregoing, the study recommends as follows:

- There is a need to insist on foreign enterprises to apply and sustain the local content requirement law recently enacted. With this, employment in the local backward and forward linkage entities will improve and this will enhance poverty reduction. However, this can only be possible if the local enterprises improved their capability to meeting up the demand of their foreign counterparts.

- For FDI to enhance poverty reduction, there is a need for the development and sustainability of the domestic absorptive capacities- human development, financial sector development, political stability, and regulatory reforms. Inadequate domestic absorptive capacities will make it impossible for local enterprises to fully compete with their foreign counterparts. In this case, the local entities will be outcompeted, hence this will be adverse to employment and poverty.

- Policymakers should sustain the existing policies as well as come up with new ones that promote FDI in capital and labour-intensive sectors. This is because neglecting any may be adverse to employment or growth and poverty. For instance, if a country focuses on promoting FDI in the capital-intensive industry in the desire to rapidly develop by abandoning the labour-intensive industry may bring about an increase in the poverty level.

However, the results of the study are somewhat limited by: data inconsistency and a limited number of observations, which are common in developing countries. Nevertheless, this study contributes to the literature on the FDI-poverty reduction relationship.

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THE EFFECT OF INTERNATIONAL MIGRANT REMITTANCES ON EMPLOYMENT PATTERNS: EVIDENCE FROM KOSOVO[3]

This study examines the effect of international migrant remittances on the employment patterns of individuals receiving them. To do that we use a nationally representative labor force survey conducted in Kosovo by Millennium Challenge Corporation. To address endogeneity issues, we employ propensity score-weighted Probit models by weighting every individual in the sample by the probability of receiving remittances based on their observed characteristics. The findings suggest that remittances decrease the employment probability of individuals who receive them, while at the same time increasing the probability of inactivity and being a family worker. The impacts are stronger for individuals from urban areas, workers over the age of 55, and individuals from non-Albanian ethnicities.
Keywords: remittances; employment; inactivity; propensity score weighting; Kosovo
JEL: J22; F22; F24; C39

1. Introduction

Kosovo's GDP per capita has grown faster than other countries in the region in the last fifteen years, despite that it remains the country with the lowest GDP in the region as well as having the highest poverty and unemployment rates (Boubtane et al., 2013; Clemens, Postel, 2018). In this situation, the effect of remittances in cushioning the negative effects of this lack of development is immense. The role of remittances in helping many families to meet their basic needs is crucial as they continue to be one of the main sources of income for many Kosovar families, helping some survive but also improving the well-being of many others (Fayissa, Nsiah, 2010).

From the macroeconomic perspective, it is evident that remittances are crucial and have a direct effect on the labour market, as they surge the level of revenue in the country, increasing so consumption which results in increased production of goods and services this, in turn, is expected to improve the labour market conditions overall (Acosta et al., 2006; Catrinescu et

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al., 2009; Portes, 2006). Nevertheless, it is stressed further that individuals are directly impacted by the remittances that they are receiving.

Although it can be measured the volume of remittances received, however, on the other hand, it is highlighted that it seems to be harder to elaborate on remittance impacts a=on those receiving individuals and families, as it is not clear (or it is a complicated puzzle) how it affects the remittance receivers (Murakami et al., 2021).

Preceding study debates have emphasised three major (or probable) motivators of the effects of remittances on labour market outcomes by discussing the categorisation of remittances as a source of income (Adams, Page, 2005; Amuedo-Dorantes, Pozo, 2012; Narayan et al., 2011; Chami et al., 2012). One view is that remittances are temporary income and therefore are used mainly for investments, which means that the remittance effects on the labour markets can only be observed in the long term as they are used mostly for human capital investments (Azizi, 2018; Murakami et al., 2021; Gibson et al., 2014).

Another popular view is that migrant family members send money home because of the need of their families, which means that remittances are a sort of compensation for the lack of local income of that household, which should produce no direct effect on the labour outcomes of the family (Démurger, 2015; Shair, Majeed, 2020). The final view categorises remittances as any other source of income, which implies that remittances may have direct effects on the employment patterns of the individuals receiving them (Ceesay et al., 2019).

The objective of this study is to contribute to the extension of the debate on the topic regarding the effect that remittances have on individuals and the working engagement of individuals from remittance-receiving families. The data for this research is extensive and comprises a reliable source of confirmed data and the research applies methods that address the endogeneity in appraising the impact of remittances on employment patterns in Kosovo. An extensive volume of inquiry has been dedicated to exploring the effect of remittances on the receiver on different aspects of remittance receivers' lives, such as household consumption, poverty, and employment patterns.

Previous research has found that remittances indeed do have positive effects on increasing household consumption (Adams, Cuecuecha, 2010; Clément, 2011; Duval, Wolff, 2016); however, they report heterogeneous effects of investment goods compared to consume goods, moreover, the effect on reducing poverty seems to be universally positive (Dey, 2015; Garip, 2014; Jimenez-Soto, Brown, 2012; Adams, Page, 2005; Morabito and Sergi, 2017; Petreski et al., 2018; Mintchev and Boshnakov, 2021)

While for employment patterns, the literature suggests that remittance-receiving individuals are less likely to be employed or even active in the labour market, usually because of more complicated trajectories to find a job because of increased reservation wages and decreased job-search effort. These findings have been replicated in many countries in different contexts, forming a solid foundation of literature on which this thesis builds (e.g., Abdul-Mumuni et al., 2019; Acosta, 2011, 2020; Cox-Edwards, Rodríguez-Oreggia, 2009; Démurger, Li, 2013; Mughal, Makhlouf, 2013; Nwokoye et al., 2020; Randazzo, Piracha, 2019).

Section 2 describes the data and provides the descriptive statistics of the sample, while section 3 discusses in detail the empirical problem of this study and explains the econometric

approach. Section 4 presents and discusses the main findings of this study while also presenting the heterogeneity analysis. The last section (5) is the concluding remarks.

2. Data and Descriptive Analysis

2.1. Data description and sample selection

This empirical analysis uses data from labour Force Survey, conducted in Kosovo in 2017 by Millennium Challenge Corporation through its program (Millennium Challenge Foundation). This cross-sectional survey provides detailed evidence on demographic characteristics, education, labour market status, work patterns, income, and a wide range of information on time use, consumption, wealth, agriculture, and other household characteristics. Most importantly, this paper provides household-level information on remittance reception which we use to construct our main variable of interest. What sets this survey apart from any other data source in Kosovo containing information regarding remittances is that this survey is the only survey with a sampling frame that covers the whole population of the country; making it a nationally representative survey. This survey collected data for 8,533 households with a total of 32,742 individuals in all 7 regions of Kosovo the data were collected on all household members above 15 years of age.

We exclude from the sample all households for which the information on the remittances is missing, moreover, since we rely on a propensity score approach to model the probability of receiving remittances, we also have to exclude from the sample all individuals for whom the information on the key individual or household characteristics are missing. Finally, we focus on men and women who were between 15-65 years old at the time of the interview; this leaves us with a total of 20,130 individuals, 3,825 of whom are from remittance-receiving households, and 16,305 from households that do not receive remittances.

As already discussed, this study aims to identify the effect of receiving remittances on labour market outcomes. Table 1 provides definitions of the key variables of this study. Starting from dependent variables, which in our case are a set of labour market outcomes, specifically employment status, being a paid employee, being a family worker, and being inactive. We keep in our sample only individuals with full information regarding our dependent and independent variables. Therefore, each individual in our sample falls into one of the categories. We know the employment status of each individual; in addition, conditional on working, we know whether they are paid employees, family workers, further conditional of not working, we know whether they are active in the labour market or not.

The information regarding remittances in the survey is collected only at the household level and not at an individual level, to overcome this issue, we define a binary indicator of remittance-receiving status, which equals *1* for all individuals living in households that receive remittances and *0* for all individuals who live in the household who do not receive household. Although, the concern regarding the mismeasurement of remittance-receiving status is valid since we do not know if every individual in the household benefits from the remittances, knowing family behaviour and strong family ties in Kosovo, it is safe to assume

that the remittances are used for mutual family benefits which means that every individual in the household benefits from the remittances.

The literature suggests that employment outcomes are quite sensitive to individual and household characteristics, for instance, prime-age workers differ dramatically in terms of employment prospects compared to younger and older workers, similarly, in the context of Kosovo the gender differences in labour market outcomes are huge, moreover living are seems to be an important factor in explaining the variation in labour market outcomes, further, education level is one of the main factor explaining labour market differences between workers Karymshakov et al., 2018). To control for these effects, we include a wide range of control variables such as age, gender, marital status, living area, ethnicity, household size, education level, and region (Binci, Giannelli, 2018; Wooldridge, 2015).

Table 1. Variable's description

Variable	Definition	Measurement
DEPENDENT VARIABLES		
Employed	*Employment status.*	Binary: 0= Not working; 1=Working.
Paid employee	*Being a paid employee.*	Binary: 0=Not a paid employee; 1=Paid employee.
Family worker	*Conditional on working whether a worker is a family worker.*	Binary: 0= Not a family worker; 1=Family worker.
Inactive	*If an individual is not active in the labour market*	Binary: 0= Active in the labour market; 1=Inactive.
INDEPENDENT VARIABLES		
Remittance receiving HH	*Living in a remittance-receiving household.*	Binary: 0=Living in a remittance-receiving; 1=Paid employee.
Age & Age^2	*Age and age squared.*	Continuous variable.
Male	*Indicator for gender.*	Binary: 0=Femle; 1=Male.
Married	*Indicator for marital status.*	Binary: 0=Single; 1=Married.
Urban	*Indicator for living area.*	Binary: 0=Rural; 1=Urbam.
Albanian ethnicity	*Indicator for ethnicity.*	Binary: 0=Non-Albanian; 1=Albanian.
Household size	*Number of members living in the HH.*	Continuous variable.
Education dummies	*Education level indicators.*	Education dummies: 1= Low level of education; 2=Medium level of education; 3=High level of education
Region dummies	*Region indicators.*	Regional dummies:1= Prishtina; 2= Mitrovica; 3= Peja; 4= Prizreni; 5= Ferizaji; 6=Gjilanil 7= Gjakova.

Source: compiled and calculated by the authors.

2.2. Descriptive statistics

Table 2 presents descriptive statistics of our sample. The sample includes a total of 20,121 individuals, of which 3,816 are from remittance-receiving households and the remaining 16,305 are from households that do not receive remittances. Table 2 is split into two parts; in the left panel, we report the raw unweighted means and percentage difference by remittance-receiving status, while on the right panel, the same analysis is presented, but now the means are weighted by propensity scores.

Table 2. Characteristics of households by remittance-receiving status

	Unweighted means				Propensity score weighted means		
	(I)	(II)	(III)		(IV)	(V)	(VI)
	Non-Remittance HH	Remittance HH	I-II % difference		Non-Remittance HH	Remittance HH	IV-V % difference
Individual characteristics							
Age	39.09 (12.70)	39.41 (13.29)	-0.81%		39.00 (12.68)	39.81 (13.23)	-2.03%
Male	0.73 (0.44)	0.71 (0.45)	2.82%		0.73 (0.44)	0.75 (0.43)	-2.66%
Married	0.70 (0.46)	0.70 (0.46)	0.00%		0.70 (0.46)	0.71 (0.45)	-1.40%
Low-level education	0.26 (0.44)	0.40 (0.49)	-35%		0.28 (0.45)	0.34 (0.47)	-17.64%
Medium level education	0.57 (0.50)	0.49 (0.50)	16.32%		0.56 (0.50)	0.54 (0.50)	3.70%
High-level education	0.16 (0.37)	0.11 (0.31)	45.45%		0.16 (0.37)	0.12 (0.32)	33.33%
Household characteristics							
Household size	4.70 (1.94)	4.67 (1.90)	0.64%		4.67 (1.91)	4.97 (2.02)	-6.03%
HH has children under 15	0.61 (0.49)	0.63 (0.48)	-3.17%		0.60 (0.49)	0.69 (0.46)	-13.04%
HH has individuals over 65	0.01 (0.08)	0.01 (0.09)	0.00%		0.01 (0.08)	0.01 (0.07)	0.00%
HH. owns agricultural land	0.52 (0.50)	0.65 (0.48)	-20%		0.53 (0.50)	0.52 (0.50)	1.92%
Urban	0.39 (0.49)	0.24 (0.43)	62.5%		0.37 (0.48)	0.37 (0.48)	0.00%
Albanian ethnicity	0.92 (0.26)	0.98 (0.15)	-6.13%		0.93 (0.25)	0.94 (0.25)	-1.06%
Prishtine	0.16 (0.36)	0.07 (0.26)	128.57%		0.14 (0.35)	0.14 (0.34)	0.00%
Mitrovice	0.13 (0.34)	0.10 (0.30)	30%		0.12 (0.33)	0.10 (0.29)	20%
Peje	0.14 (0.35)	0.12 (0.32)	16.66%		0.13 (0.34)	0.15 (0.35)	-13.33%
Prizren	0.14 (0.35)	0.17 (0.38)	-17.65%		0.14 (0.35)	0.17 (0.37)	-17.65%
Ferizaj	0.16 (0.36)	0.10 (0.30)	60%		0.15 (0.36)	0.16 (0.36)	-6.25%
Gjilan	0.11 (0.31)	0.12 (0.33)	-8.33%		0.11 (0.31)	0.12 (0.33)	-8.33%
Gjakove	0.17 (0.38)	0.31 (0.46)	-45.16%		0.20 (0.40)	0.18 (0.38)	11.11%
Household head characteristics							
Head of the HH is male	0.90 (0.29)	0.91 (0.29)	-1.09%		0.90 (0.30)	0.93 (0.25)	-3.22%
Age of the HH head	53.41 (11.29)	54.15 (11.99)	-1.37%		53.55 (11.34)	53.14 (11.68)	0.77%

	Unweighted means				Propensity score weighted means		
	(I)	(II)	(III)		(IV)	(V)	(VI)
	Non-Remittance HH	Remittance HH	I-II % difference		Non-Remittance HH	Remittance HH	IV-V % difference
Low-level education (HH head)	0.34 (0.47)	0.46 (0.50)	-26.08%		0.36 (0.48)	0.38 (0.49)	-5.26%
Medium-level education (HH head)	0.54 (0.50)	0.47 (0.50)	14.9%		0.53 (0.50)	0.51 (0.50)	3.92%
High-level education (HH head)	0.12 (0.33)	0.08 (0.27)	50%		0.12 (0.32)	0.11 (0.32)	9.09%
Employed HH. head	0.74 (0.44)	0.72 (0.45)	2.78%		0.72 (0.45)	0.79 (0.41)	-8.86
Dependent variables							
Employed	0.82 (0.38)	0.67 (0.47)	22.4%		0.81 (0.39)	0.72 (0.45)	12.5%
Paid employee	0.65 (0.48)	0.52 (0.50)	25.0%		0.64 (0.48)	0.56 (0.50)	14.28%
Family worker	0.18 (0.38)	0.33 (0.47)	-45.45%		0.19 (0.39)	0.26 (0.44)	-26.92%
Inactive	0.51 (0.50)	0.56 (0.50)	-8.92%		0.51 (0.00)	0.54 (0.50)	-5.55%
Observations Pseudo-R-squared	16,305 0.25	3,816 0.13	20,121 0.24	0.49	16,305	3,816 0.24	20,121 0.15

Source: compiled and calculated by the authors.

On the left panel of Table 2, we can see that individuals living in households not receiving and those receiving remittances are almost identical to those living in regarding the demographic patterns; though, they significantly differ in other aspects. One of the major differences is evident, in terms of education, of those receiving compared to non-receivers of remittances as they are 35% more likely to have a low level of education and up to 45 percent less likely to be highly educated, this is extremely important for our analysis as it is widely known that the level of education is an important predictor of labour market success, therefore a simple mean comparison between remittance-receiving and non-receiving individuals would produce biased estimates simply because these groups differ this much in terms of education. Moreover, the probability that the individuals living in remittance-receiving families have small children is higher by 3%. In terms of the geographical extent of remittance-receiving individuals, it is evident that it is 63% more likely that they live in a rural area, thus they are more focused and engaged in the agriculture sector. The research has revealed that the majority of remittance-receiving individuals and families are mainly located or come from the South-West of Kosovo, mainly in Peja and Prizren region, which is also traditionally known for migration in the past several decades. Whereas, they are less likely to be from the region of Prishtina and Ferizaj, which are considered to have a more developed industry even in the past. Another difference that the research has reviled is the role of the family head and the role that they play and the differences that they make in receiving and non-receiving households. It is even more imperative when considering the patriarchal

tendency in developing countries and emerging economies (Chami et al., 2012; Justino, Shemyakina, 2012). It is evident that the lower the education the family head member, the more likely is to be part of a receiver family, whereas the family heads that are more successful in gaining higher education are more likely to belong to a non-receiver remittance household, As already noted, these differences give a clear indication that comparing these two groups head-to-head without further empiric procedures would overestimate the parameters of interest dramatically, therefore to balance the groups and make the analysis more reliable we employ a propensity score weighting procedure.

On the right panel of Table 2, we see that the propensity score weighting procedure has achieved its aim to a large extent as the differences are reduced significantly and the groups are overall much more balanced in all aspects. Most importantly the educational differences are reduced by more than half in terms of low level of education the groups are the same in terms of medium level of education, moreover even though the difference in the high level of remains large it has been reduced by more than 12pp. Further, differences in the living area, region of residence, ethnicity, and household head characteristics are reduced to the minimum. This, we believe, balances the groups to the extent that makes the comparison free of biases. Therefore, we are confident that the selected strategy provides estimates that are free from unobserved heterogeneity biases.

The bottom rows of Table 2 compare the selected labour market outcomes, and as it is seen, the differences are substantial; however, we continue the discussion about them in Figure 1 presented below.

In Figure 1, we analyse the dynamics of selected labour market outcomes by age in four separate graphs. The overall trends, for both remittance receivers and non-receivers, are similar and consistent with the literature suggestions, meaning that young workers (15-24) are less likely to be employed, but more likely to be inactive as a good proportion of them are still on education. Moreover, the group with the highest probability of employment and the lowest probability of inactivity are prime-age workers (25-54). While old workers (55+) exhibit ever-worsening labour market trends with decreasing probability of employment and an increasing probability of becoming inactive.

Panel (a) of Figure 1 shows the average employment rate by age. The difference between the two groups is clear and systematic; the figure clearly shows that living in a household that receives remittances is associated with a substantially lower probability of employment. However, from the graph, it is impossible to differentiate between the remittance effect and unobserved heterogeneity effect, we quantify this relationship at a late phase in our analysis. Overall, panel (a) suggests the existence of three different patterns in employment. First, the differences between remittance-receivers and not receivers for young workers (15-25) are not that consistent, we believe this to be due to the extremely small number of individuals employed in this age group. Second, the difference in employment probability for prime-age workers (25-54) is clear and consistent, meaning that remittance receivers lag behind non-receivers on average for every single age. Third, the average employment difference is the largest for old workers (55+).

Figure 1. labour market outcome averages by age
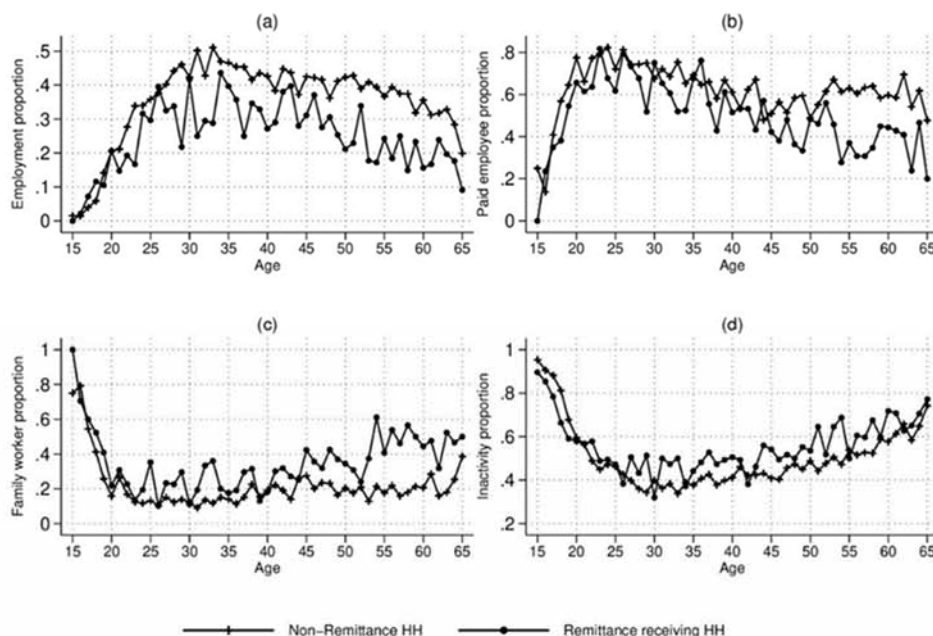
Labour market outcome averages by age, a comparison between household remittance-receiving status. Average employment by age in panel (a), an average rate of paid employee by age in panel (b), an average rate of the family worker by age in panel (c) and average proportion of inactivity by age in panel (c).
Source: compiled and calculated by the authors.

Panel (b) plots the average shares of being a paid employee conditional on being employed. In this case, the difference between remittance-receivers and non-receivers is a bit more unclear, but it is still evident that remittance-receiving individuals are less likely to be paid workers. Interestingly, the difference in being a paid employee for old workers (55+) remains even when they are employed, which suggests that the probability of self-employment or being a family worker is higher among remittance receivers. Panel (c) shows the average shares of being a family wage earner, which highlights the fact that remittance receivers are more likely to be family workers compared to non-receivers. The patterns are a reflection of the first two graphs, in this case, the probability of being a family worker is disproportionally larger for remittance receivers, up to 60 percent of old (55+) remittance receivers are family workers compared to around 20 % of those from non-remittance receiving households. Panel (d) presents the average shares of being inactive. In this aspect, the differences between remittance receivers and remittance non-receivers are the smallest, but still consistent, despite the age the probability of being inactive is slightly higher for remittance-receivers compared to the other group.

In sum, in Figure 1, we can read a descriptive story that suggests that remittances are relaxing individuals who receive them from the need to find a paid job and are enabling them to engage

in household activities to a greater extent. However, we cannot draw causal conclusions about this relationship without employing more sophisticated methods.

3. Econometric Approach

To estimate the effect of remittances on labour market outcomes, this study employs a probit model, which models the inverse normal distribution as a linear combination of the predictors. The model takes the form:

$$\Pr(Y_i = 1 | X) = \phi(\beta_0 + \beta_1 Remittances_i + \beta' X_i + \varepsilon_i) \tag{1}$$

The set of outcome variables Yi captures labour market outcomes consisting of employment status, being paid worker, being a family worker, or being inactive. The function ϕ represents the cumulative normal distribution. The main variable of interest is captured by the binary indicator $Remittnces_i$, which equals one if individual i lives in a household that receives remittances and zero if individual i lives in a household that does not live in a remittance-receiving household. We include a wide range of control variables which are captured by vector β' such as household size, age, and its square, binary indicators for being male, married, Albanian, living in an urban. It also includes three dummies for education levels and regions dummies (Asiedu, Chimbar, 2020; Nwokoye et al., 2020).

Despite controlling for a wide range of household and household characteristics, the approach presented above actually directly compares individuals living in remittance-receiving households with those living in households that do not receive remittances. If we could assume that the remittance-receiving status is entirely random, then this comparison would produce unbiased estimates. However, remittance-receiving status is far from being a random occurrence (Butschek, Walter, 2014). Therefore, the remittance-receiving status may be endogenous, as it is conditioned by having a migrant household member or a relative. The migration decision itself could be highly selective due to unobserved household or individual characteristics (Berthélemy et al., 2009; Ayalew, Mohanty, 2022; Tsegai, 2007). For instance, individuals from poorer households may be both more prone to out-migrate and have, in general, worse labour market prospects, or migrant household members or relatives may send remittances to their relatives in Kosovo because they are facing tough economic conditions or prolonged unemployment spells (Boubtane et al., 2013; Ceesay et al., 2019). The endogenous selection into migration or receiving remittances leads to a correlation between our variable of interest and the error term ε_i, providing us with biased estimates forβ_1, therefore, this coefficient cannot be interpreted causally without addressing this issue. The unweighted means in Table 2 prove this suspicion by showing that individuals living in households who do not receive remittances differ significantly from those who do.

To address the above-mentioned selection issues, this study uses a propensity score weighting procedure, which balances the distribution of observable characteristics of both groups (remittance receivers and non-receivers). Specifically, with this approach, we model the probability of receiving remittances conditional on observed household and individual characteristics, and then these probabilities are used as weights that enable us to balance two

groups. Formally the probability of receiving remittances (R=1) is modelled by a probit model presented by the following equation:

$$P^R[R_i] = \delta X_i + \varepsilon_i \tag{2}$$

The probability to receive remittances is estimated by including a comprehensive set of individual and household characteristics in the vector δX_i. Specifically, we include household size, number of children below 15 in the household, number of old people in the household, living is, ethnicity, ownership of agricultural land, household head sex, household head age, household head education, household head employment status and regional dummies. The estimated probabilities using this model are used to construct propensity scores weights based on the remittance-receiving status, as Table 1 shows this procedure indeed balances the two samples (remittance receivers and non-receivers) as they are much more balanced after the weighting is applied. Finally, we use weighted least squares estimator to compare the labour market outcomes of individuals who have the same probability of receiving remittances despite their true remittance-receiving status. This gives unbiased estimates of the parameter β_1, allowing us to interpret it causally.

4. Results and Discussion

4.1. Main results

The average marginal effects of the parameters as reported in Table 3. This section focuses primarily on the interpretation of the consequence of remittances, on the probability of being employed, a paid employee, a family worker, and an inactive individual. Columns (1-4) show the average marginal effects of unweighted probit models, which we believe provide overestimated coefficients due to the reasons discussed above, we include them here only as a benchmark for comparison with our preferred weighted probit estimates, which are shown on the columns (5-8) of Table 3.

In the unweighted panel (Columns 1-4) of the analysis, we show that individuals living in remittance-receiving households face worse labour market prospects overall compared to individuals living in a non-remittance-receiving household. Namely, the probability of being employed is up to 6.6 percent lower for remittance receivers; moreover, the probability it is evident that working as a paid worker is 4.8% lower, though the highest probability, with 4.6%, for an individual to be an unpaid member of the family, and being an inactive family member is less than one percent higher.

The fifth column of Table 3 shows the effect of remittances on the employment probability with propensity score weighted observations. The table shows that compared to the unweighted estimates the effect is around 1.9 percent smaller (-6.6 percent vs -4.7 percent), suggesting that the unobserved characteristics that drive remittance-receiving status have inflated the effect. In both unweighted and weighted models, we include the set of controls usually used in explaining employment outcomes. As expected, we find significant effects of gender, living area, marital status, and age on the probability of employment; moreover, the effect of education and region of residence seems to have a huge impact on this probability. Therefore, after all these control variables have been included in the model, this means that

the models compare individuals only within these categories and within the same probability range of receiving remittances. Hence, we believe that the unbiased estimated effect of remittances on employment probability is around -4.7 percent, which is pretty high. The estimated effect on employment probability is consistent with reported effects in several studies (e.g., Abdul-Mumuni et al., 2019; Acosta, 2011, 2020; Cox-Edwards, Rodríguez-Oreggia, 2009; Démurger, Li, 2013; Mughal, Makhlouf, 2013; Nwokoye et al., 2020; Randazzo, Piracha, 2019).

Table 3. Marginal effects of receiving remittances on labour market outcomes

	Unweighted				Propensity score weighted			
	Employed	Paid employee	Family worker	Inactive	Employed	Paid employee	Family worker	Inactive
Remittance receiving HH	-0.066*** (0.007)	-0.048*** (0.013)	0.046*** (0.010)	0.009* (0.005)	-0.047*** (0.009)	-0.050*** (0.019)	0.037*** (0.012)	0.011* (0.007)
Age	0.042*** (0.001)	0.004 (0.003)	-0.019*** (0.002)	0.019*** (0.001)	0.042*** (0.002)	0.007* (0.004)	-0.021*** (0.003)	0.018*** (0.002)
Squared age	-0.000*** (0.000)	-0.000** (0.000)	0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	-0.000** (0.000)	0.000*** (0.000)	-0.000*** (0.000)
Male	0.289*** (0.005)	0.091*** (0.012)	-0.162*** (0.008)	-0.318*** (0.004)	0.298*** (0.009)	0.112*** (0.016)	-0.172*** (0.010)	-0.337*** (0.006)
Married	0.003 (0.008)	-0.085*** (0.015)	0.032*** (0.012)	0.104*** (0.006)	-0.006 (0.014)	-0.100*** (0.022)	0.059*** (0.017)	0.134*** (0.011)
Urban	0.022*** (0.006)	0.097*** (0.011)	-0.163*** (0.009)	-0.022*** (0.005)	0.012 (0.010)	0.133*** (0.019)	-0.205*** (0.013)	-0.016** (0.007)
Albanian ethnicity	0.018* (0.011)	-0.057*** (0.021)	0.043** (0.017)	0.031*** (0.008)	0.086** (0.037)	0.105 (0.087)	0.111*** (0.025)	0.009 (0.020)
Household size	-0.001 (0.002)	-0.011*** (0.003)	0.008*** (0.002)	-0.001 (0.001)	0.009*** (0.003)	-0.010** (0.005)	0.005 (0.003)	-0.004** (0.002)
Medium level of education	0.157*** (0.006)	0.159*** (0.011)	-0.128*** (0.008)	-0.109*** (0.004)	0.118*** (0.012)	0.145*** (0.023)	-0.120*** (0.012)	-0.098*** (0.008)
High level of education	0.325*** (0.009)	0.375*** (0.016)	-0.277*** (0.015)	-0.288*** (0.011)	0.288*** (0.016)	0.370*** (0.027)	-0.234*** (0.026)	-0.280*** (0.021)
Mitorvice	-0.013 (0.010)	-0.052** (0.020)	0.056*** (0.017)	-0.052*** (0.008)	-0.025 (0.017)	-0.075** (0.032)	0.105*** (0.025)	-0.046*** (0.014)
Peje	0.012 (0.010)	-0.119*** (0.019)	0.108*** (0.016)	0.015* (0.008)	0.031* (0.018)	-0.168*** (0.032)	0.157*** (0.024)	0.011 (0.014)
Prizren	0.056*** (0.011)	-0.042** (0.019)	0.015 (0.016)	-0.029*** (0.008)	0.046** (0.021)	-0.103** (0.041)	0.060** (0.024)	-0.023 (0.015)
Ferizaj	-0.001 (0.010)	-0.042** (0.019)	-0.009 (0.017)	0.011 (0.008)	0.004 (0.019)	-0.076** (0.036)	0.030 (0.031)	0.029* (0.015)
Gjilan	0.047*** (0.011)	-0.091*** (0.020)	0.080*** (0.017)	0.000 (0.009)	0.042** (0.018)	-0.148*** (0.032)	0.140*** (0.024)	0.009 (0.014)
Gjakove	-0.026*** (0.010)	-0.205*** (0.018)	0.131*** (0.014)	-0.006 (0.008)	-0.040** (0.016)	-0.245*** (0.028)	0.170*** (0.021)	0.007 (0.012)
Observations	20053	7932	7932	20053	20053	7932	7932	20053
Pseudo-R-squared	0.25	0.13	0.24	0.49	0.24	0.15	0.27	0.49

Source: compiled and calculated by the authors.

The reasons behind this difference we believe to be driven by several factors. First, individuals that belong to a remittance-receiving household due to higher financial support and security are more likely to have a higher reservation wage compared to the mean wage within the skill level that individuals possess, hence discouraging remittance receivers from getting jobs. Another possible explanation could be the effort that one needs to put in to find jobs in a tight labour market such as Kosovo's, again as a result of relative security remittance receivers could put less effort in searching for work even if their reservation wage matches that of the market.

The sixth column (6) of the same table depicts the effect of remittances on the probability to be a paid employee. As opposed to the employment probability, in this case, both weighted and unweighted models yield almost identical effects (-4.8 percent vs -5 percent). Similar to the employment probability, we find significant that personal characteristics such as gender, living area, and household size play an important role in explaining the paid employee variation; however, the most important factors by far are education and region of residence differences. Again, the inclusion of these individual characteristics allows us to make only within-group comparisons, while the propensity score weighting allows us to compare individuals only in the same probability range of receiving remittances. Therefore, the unbiased consequence of remittances on the probability of being a paid employee is around -5 percent. Hence, it is confirmed that the research findings are in line with the majority of the literature on this topic (e.g., Acosta, 2011; Démurger, Li, 2013; Mughal, Makhlouf, 2013; Nwokoye et al., 2020; Randazzo, Piracha, 2019). The drivers behind this finding, we believe to be related to the ones that we discussed for the employment probability (Van Hear et al., 2018). Again, because of the relative financial security remittance receivers create due to the financial support and stable income, it is more that they are engaged in activities that are characterised as self-employed or even in non-payable activities only to retain the flow of remittances or even not to have any impact on the continuous flow (income) through remittance.

Column 7 illustrates the probability of being a non-played family worker based on the direct effect that remittances have on those families. In this case, the effect of weighted and unweighted models differs by almost 1% (4.7 percent vs 3.6 percent), suggesting that the status of the unobserved characteristic has overestimated the effect. Individual characteristics seem to play a huge role in explaining the probability of being a family worker.

As predicted, based on the cultural background and patriarchal tendency in developing and poor countries, the probability for males (based on gender variable) is 17% smaller of being a family worker, which is mainly impacted by the living area (rural vs urban) and the level of education of family members (Binci, Giannelli, 2018; Dey, 2021; Ebrima, Ceesay, 2020). After setting the possible impact of these characteristics, by evaluating them in the probit model, the likelihood of being an unpaid worker is 3.7% for members part of families that receive remittances. The projected surge in the prospect to work as a family unpaid worker is similar to most of the findings in other studies (e.g., Abdul-Mumuni et al., 2019; Démurger, Li, 2013; Mughal, Makhlouf, 2013; Nwokoye et al., 2020).

The eighth and final column of Table 3 shows the impact of remittances on the probability to be inactive in the labour market. The effect of weighted and unweighted models differs only slightly (0.7 percent vs 1.1 percent). Similar to all other variables, individual

characteristics seem to play a huge role in elucidating the possibility of inactivity. As anticipated, the female members of families are likely to be more inactive compared to male members of the same family. Which is disproportionally large and is affected directly by education level. Receiving remittances increases the probability of inactivity by more than 1 percentage point. Our finding on the inactivity decrease is consistent with reported effects in several studies (e.g., Abdul-Mumuni et al., 2019; Acosta, 2011, 2020; Cox-Edwards, Rodríguez-Oreggia, 2009; Démurger, Li, 2013; Mughal, Makhlouf, 2013; Nwokoye et al., 2020; Randazzo, Piracha, 2019). The mechanism driving this finding is similar to the ones already discussed.

4.2. *The effect of remittances of different demographics*

This part of the report elaborates on how diverse groups are impacted by remittances concerning their demographic characteristics. Table 4 and Figure 2 summarise the average marginal effects of remittances on labour market outcomes by different groups. Separate effects are presented by age, gender, lignin area, and ethnicity.

Table 4. Marginal effects of receiving remittances on labour market outcomes by different sub-samples

	Unweighted				Propensity score weighted			
	Employed	Paid employee	Family worker	Inactive	Employed	Paid employee	Family worker	Inactive
Age groups								
Young (15-24)	-0.018 (0.013)	-0.046 (0.032)	0.019 (0.029)	-0.002 (0.006)	-0.014 (0.013)	-0.026 (0.034)	-0.002 (0.028)	-0.004 (0.006)
Prime age (25-54)	-0.076*** (0.010)	-0.028* (0.016)	0.036*** (0.012)	0.008 (0.008)	-0.056*** (0.012)	-0.024 (0.020)	0.035** (0.014)	0.014 (0.009)
Old (55+)	-0.096*** (0.018)	-0.096*** (0.033)	0.098*** (0.024)	0.020 (0.015)	-0.062*** (0.021)	-0.109*** (0.032)	0.074*** (0.025)	0.017 (0.016)
Sex Male	-0.098*** (0.012)	-0.043*** (0.016)	0.051*** (0.011)	0.008** (0.004)	-0.053*** (0.015)	-0.039* (0.021)	0.039*** (0.013)	0.003 (0.004)
Female	-0.036*** (0.009)	-0.037* (0.021)	0.023 (0.019)	0.012 (0.009)	-0.041*** (0.009)	-0.027 (0.020)	0.014 (0.020)	0.024** (0.012)
Living area								
Urban	-0.114*** (0.014)	0.020 (0.025)	0.009 (0.014)	0.016* (0.009)	-0.082*** (0.015)	0.030 (0.028)	-0.013 (0.012)	0.021* (0.011)
Rural	-0.044*** (0.009)	-0.065*** (0.016)	0.058*** (0.013)	0.006 (0.006)	-0.022** (0.009)	-0.066*** (0.017)	0.065*** (0.017)	0.004 (0.007)
Ethnicity Albanian	-0.063*** (0.008)	-0.047*** (0.014)	0.049*** (0.010)	0.007 (0.005)	-0.034*** (0.008)	-0.027* (0.015)	0.046*** (0.012)	0.007 (0.006)
Non-Albanian	-0.096** (0.044)	-0.107 (0.077)	-0.047 (0.072)	0.065** (0.030)	-0.132*** (0.035)	-0.202*** (0.058)	-0.068* (0.038)	0.064** (0.030)

Source: compiled and calculated by the authors.

The fifth column of Table 4 and panel (a) of Figure 2 shows average marginal effects for employment. The effect of receiving remittances is negative and statistically significant for

most groups. Being a member of a household that receives remittances seems to have the largest negative effect on employment probability for non-Albanian communities (-13.2 percent) followed by urban workers (-8.2 percent), old workers (6.2 percent), and males (-5.3 percent). However, the negative effect on employment probability seems to be universal, the effect is also large for prime-age workers (-5.6%), Albanian workers (-3.4 percent), and rural workers (-2.2 percent). The only group that seems to be unaffected by remittances are young workers, even though this is likely to be from the small number of observations on this group.

Figure 2. *Average marginal effects of the regressors for propensity score weighted models*
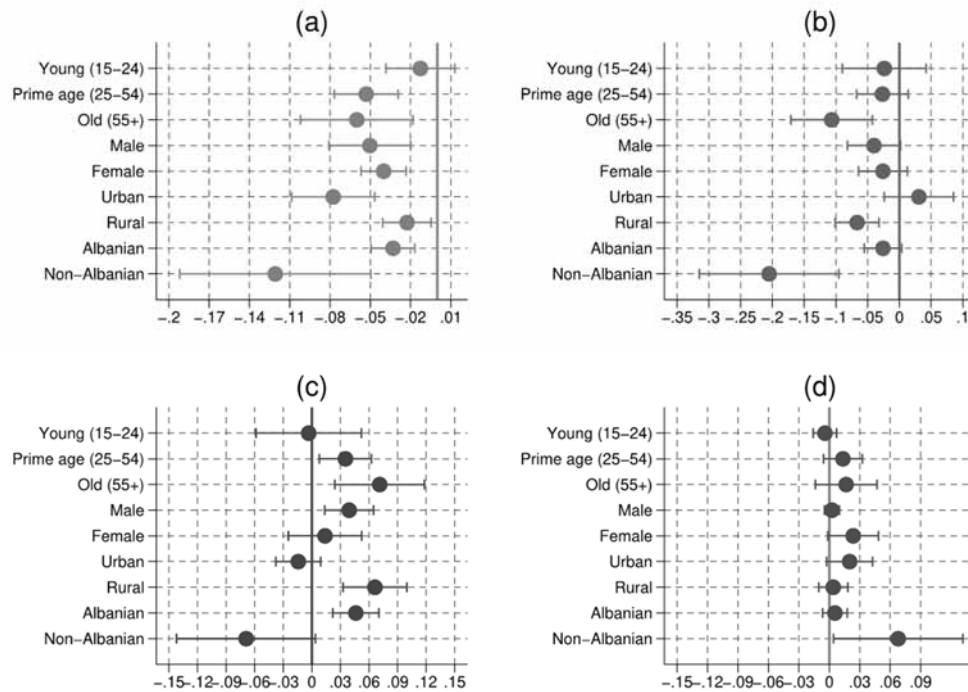
Average marginal effects of the regressors for propensity score weighted models are plotted on graphs. For simplicity, only the coefficients of remittances are plotted; however, all models include the full set of covariates, namely: age and age squared, binary indicators for male, married, urban, Albanian ethnicity, household size, education dummies, and region dummies. Propensity score weighted average marginal effects for employment in panel (a), propensity score weighted average marginal effects for a paid employee in panel (b), propensity score weighted average marginal effects for family worker in panel (c), propensity score weighted average marginal effects for inactivity by age in panel (d).

Source: compiled and calculated by the authors.

The sixth column of Table 4 and panel (b) of Figure 2 shows the average marginal effects of being a paid employee. In contrast to unemployment, the effect of these outcomes is, in most

cases, not statistically significant or marginally significant. The negative effect on this variable seems to be entirely driven by old workers (-10.9 percent), rural workers (-6.6 percent), and non-Albanian communities (-20.2 percent). While for other groups, the effect is quite small and marginally not statistically significant.

The seventh column of Table 4 and panel (c) of Figure 2 shows the average marginal effects of being an unpaid family worker. Receiving remittances seems to increase the probability of being a family worker for old workers (7.4 percent), rural workers (6.5 percent), Albanian Workers (4.6 percent), and male workers (3.9 percent). The remittances seem to not affect the probabilities of being a family worker for young workers, females, and urban workers. Surprisingly, it seems to have a negative consequence on the likelihood of being a family worker in non-Albanian communities. Finally, column 8 within Table 4 and panel (d) for Figure 2, illustrates the heterogeneous effect of inactivity in the labour market triggered by remittances. The increasing probability of inactivity as a result of remittances seems to be entirely driven by females, urban workers, and non-Albanian workers.

5. Conclusions

Remittances are an important income source for many Kosovar families, and in the public discourse, the general perception is that even though they are helping the economy at the individual level the remittances are contributing to deformities in worker behaviours. However, the empirical evidence to back up these claims is scarce. Therefore, this study aimed to analyse the effect of remittances on employment patterns in Kosovo. Data used for this research is retrieved from a survey conducted by Millennium Challenge Corporation. Contrary to most previous studies on this topic in Kosovo, we go beyond means comparisons and simple OLS models. Our approach aimed at addressing endogeneity issues in the remittance reception status by employing a propensity weighting procedure.

Our findings suggest that remittances have significant implications on the employment patterns of individuals living in remittance-receiving households. Specifically, remittances seem to lower the overall probability of being employed or a paid member by up to 5%, whereas increasing the probability of being a family worker or being inactive by 3.7% and 1.1%, respectively. These effects are larger for non-Albanian communities, rural workers, old workers, and males. The suggestion of these findings seems to be that the remittances help create a more relaxed approach in the labour market for remittance-receiving individuals, possibly as a result of a relatively more secure financial position. We believe that the remittances increase the reservation wage and decrease job-search efforts resulting in a tougher scenario for getting jobs.

The findings of this empirical analysis provide an important contribution to the literature on the effects of remittances on individual labour market behaviour in Kosovo. It adds to the scarce literature on this topic and also provides possibly the first analysis of the heterogeneous effects by using a reliable database. Therefore, future studies ideally should address this drawback.

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SOCIAL RESPONSIBILITY OF HIGHER EDUCATION UNDER MARTIAL LAW[7]

The system of higher education has always been socially responsible to any society. Currently applied in Ukraine, martial law complicates the conditions of delivering higher education services. According to the analysis results, universities should choose alternative systems of providing educational services depending on the proximity of military operations. Factor analysis revealed significant indicators of quality and social responsibility in higher education provision; the cluster analysis classified the territories according to their actual level of social responsibility according to the location of the universities; the game theory has optimised the social responsibility system of service provision. The study developed two models: clustering the quality of higher education services under martial law and optimising higher education services according to the level of social responsibility. The identified 6 clusters differ in terms of the standard of quality and safety/social responsibility of higher education services.

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Based on Ukrainian universities, implementing the developed methodology was achieved as of the spring 2022. As revealed by monitoring of the situation, 32 percent of universities are able to provide higher education services at a sufficiently high level. The aim of the study is to optimise the provision of high quality and socially responsible higher education under martial law. The potential beneficiaries of the research results are students and teachers of Ukrainian higher education institutions located in territories under various degrees of military threats. Optimising the social responsibility system of service provision will improve the quality and reliability by 10 per cent and identify points of growth and stabilisation of at least 15-20 percent.
Keywords: driver indicators; on-line education; Internet sources; war
JEL: C 31; I 23; H53

1. Introduction

War and conflict have a systemic impact on higher education in any country (Akdağ et al., 2018). University buildings are damaged by attacks or invasions (Ashour, 2022). Staff and students are killed or threatened with forced displacement. University provision is weakened as post-conflict financial resources are prioritised for basic needs (Asderaki, 2019). Experience in countries emerging from armed conflicts shows that, in most cases, higher education systems are not a priority during post-conflict reconstruction (Ayoubi et al., 2011).

Universities are more likely to suffer in war to a greater extent than any other institution. This is due to the restriction of academic freedoms and a massive brain drain shaped to the flight of cutting-edge academics, teachers, and students (Kearney et al., 2012). According to the experience gathered by war-torn countries, it appears difficult or impossible for higher education systems to reproduce the human capital required for national reconstruction (Kember et al., 1991).

A system-wide approach (Knysh et al., 2020), meaning a collective effort (Kester, 2013), is needed to ensure high-quality higher education in war circumstances. Notably, a combination of factors justifies the relevance of this research. From a theoretical point of view, the potential for developing and applying new technologies of higher education provision opens under martial law (Lange, 1986).

In the practical context, an algorithm is developed to cluster educational services according to the level of social responsibility achieved (Kwiek, 2014). Its implementation will initiate a new tool to use the drivers of university organisations on corporate-social principles under martial law (Lebeau et al., 2015).

Martial law is a special legal regime introduced in Ukraine or in certain areas thereof in case of armed aggression or threat of attack, danger to state independence, territorial integrity and provides for granting relevant state authorities, military commanders, military administrations and local self-government bodies the powers necessary to prevent the threat, repulse armed aggression and ensure national security, as well as temporarily limiting the constitutionality of the state of emergency.

Under martial law, ensuring the social responsibility of providing higher education services requires the heads of departments (divisions) of education and science of regional state

administrations, higher, professional higher and professional (vocational) education, enterprises, institutions and organisations, included in the MES management area, to implement the following measures:

1) Provide educational services in the determined volumes, in accordance with the determined educational programmes and plans;

2) organise the quick resumption of the educational process in case of its interruption as a result of military operations;

3) to notify the administration of higher education institutions, students and teachers about the occurrence of an emergency situation: military threat, shelling, bombing;

4) inform about possible consequences, ways and methods of protection, actions in the area of a possible emergency situation;

5) involve additional forces and means of protection of students and teachers in case of emergency situations;

6) create and use material reserves to prevent emergencies and eliminate their consequences;

7) immediately notify students and teachers, educational authorities, civil defence of the Regional State Administration, territorial bodies of the Security Service, the State Emergency Service and the Ministry of Education and Science of the threat of an emergency situation, disruption of the functioning of the university or the threat of termination of the provision of educational services;

8) in case of an immediate threat to the life and health of students and teachers at the HEI, put in place an Evacuation Plan for the educational institution.

Thus, the study of social responsibility and the new drivers of university organisation on corporate-social principles under martial law poses an urgent research issue. The study aims to develop models of optimisation of higher education provision by the level of social responsibility under martial law. The objectives of this study are as follows: to cluster the territories of Ukraine on the level of social responsibility and the possibility of providing higher education services under martial law; to propose optimal models of operation of higher education institutions (HEIs) under martial law. The place of the study is Ukraine; the study period is February – March 2022.

2. Literature Overview

The experiences gained by various countries in organising education services in war circumstances constitute grounds for their division into two groups.

The first group is dominated by the number of successful examples of a country's education recovery from a military crisis (Mckenna, 2006). Within the group, illiteracy was prevalent at the outbreak of hostilities (Moore, 1997). This group consists mainly of countries in Southeast Asia and Africa. Such countries as India, Pakistan, Bangladesh, and Sri Lanka developed and successfully implemented 5-year education plans (Zgaga, 2013). The main

objectives of those plans included achieving universal primary education practices, eradicating illiteracy, establishing vocational and skills training programs, raising standards, modernising all levels of education with an emphasis on technical education, science, and environmental education, and providing high-quality education in every district of the country. And education was commonly free, anywhere from kindergarten to the university level. In sub-Saharan Africa, education ranged from simple homeschooling (Kalahari tribes) to the sophisticated education system of the highly organised society in West Africa (Liberia, Sierra Leone, Guinea). Since African countries won their independence at the end of the 20th century, they have abolished racial segregation and carried out reforms. Modern education in these countries can be seen in terms of a former colonial status, except in Ethiopia, Liberia, and South Africa. In Ethiopia, the most progressive transformations have taken place. The aims of education were stated as follows: education for production, education for scientific consciousness, and education for social consciousness (Vargas-Hernández et al., 2016).

Looking at the past from today's perspective, the following trend can be observed - violent conflicts are characteristic of playing a significant role in deepening crises in higher education, as well as in general. We are talking about the fact that in the last decade, the spread of national and international conflicts in the Middle East, Africa, Eastern Europe, Latin America, the Balkans and South-East Asia has posed many challenges to higher education systems, among them considerable humanitarian losses, destruction of infrastructure, and psychological trauma resulting from prolonged exposure to high-risk zones (164). It is telling enough that, according to the Institute for Economics and Peace, among the 162 countries in the world in 2014, only 11 had nothing to do with the conflict.

The second group of education reforms includes various strategies and plans to overcome the war crisis in countries where the education system, including higher education, had been well-developed before the war started (Stevens et al., 2021). As an example, the Chicago Plan for undergraduate education reform might be mentioned. It was proposed in the United States during the Second World War. The plan offered an accelerated two-year education form where freshmen were attached to undergraduate instructors. The program's aim was not to prepare young people only for war but also for the reconstruction of the country. As a result, the majority of developed countries reduced the undergraduate training period from four to three years (White, 1982; Zhou et al., 2021). Separate examples are the impact of the late 20th and early 21st century color revolutions on a country's education system (Trespalacios et al., 2021). For instance, Iraq's education system under Saddam Hussein was open to all population segments, including women. Since the imposition of international sanctions in the 1990s, it has been virtually destroyed (Mason, 2000). The US invasion brought the infrastructure (equipment, libraries, buildings) of almost all Iraqi universities to ruin. Taken together, the intellectual and historical legacy of Iraqi higher education has been lost. Many university staff members were kidnapped and murdered, while students faced threats and intimidation from fundamentalist militia groups (Moore, 2009). As another example, one may cite the education crisis (Al Lily et al., 2020) triggered by the COronaVIrus Disease 2019, coronavirus infection 2019-nCoV (Covid-19) pandemic that, in fact, prepared the education system of all countries of the world to exist in a demanding restrictive institutional environment (Popa et al., 2020). During the two years of the pandemic, the experience of distance learning was successfully incorporated (Tavangarian et al., 2004). Countries used various options and combinations. To name a few, e-learning (Sun et al.,

2020) or online learning (Singh et al., 2019), where the Internet is the learning environment, virtual learning applied in courses where learners study outside the classroom (Sharpe et al., 2006), distance learning for those studying individually by post (Zhu et al., 2020), and open learning through the open-university system (Sabzalieva, 2017).

Based on the experience of the functioning of the higher education system during and after the war, in our view, we should try to implement the experience of incremental functioning in different countries (Asderaki, 2019; Ashour, 2022; Ayoubi; Massoud, 2011). The essence of this approach is that different parts of the system are developed at different times and rates, and if one part is ready, then it is integrated into the system.

The possibility of using the experience of incremental higher education functioning in the context of military operations in Ukraine is limited by the unpredictable consequences of the new policy; the regulation of the procedure of transition to new conditions of higher education provision; insufficient resources and instability of the system of social responsibility of universities and the state to the participants of the educational process. It is obvious that this model is more plastic, as it allows changing individual elements of the proposed action without radically restructuring other elements.

The relationship between the level of education, mutual social responsibility and the degree of conflict in a society has been studied by many scholars (Trespalacios et al., 2021; Zgaga, 2013). For example, (Van Rooij, 2012) suggests that a high level of intellectual culture ensures quality communication, social awareness and responsibility in a conflict society. This scholar attributes this correlation to the fact that a person with deep knowledge, multiplied by a personal desire for justice, will not engage in any form of aggression, including warfare. Conversely, people with a low level of education, according to (Stevens et al., 2021), are more easily involved in military conflicts, as a lack of ability to think critically about complex conflict situations in society reduces their level of social responsibility and allows them to be easily manipulated.

These theses were confirmed by Ukrainian scholars (Oleksiyenko et al., 2021; Zhuravka et al., 2021), who investigated the experience of hostilities in Ukraine in 2014-2021. They concluded that it was the level of teaching in displaced universities and the degree of social responsibility of the academic community and the state to provide the necessary resources for the higher education system that solved the difficult problem of peacebuilding, fostering students' love and respect for all citizens of their state and the world as themselves.

Many authors (Kwiek, 2014; Lebeau et al., 2015) agree that the social responsibility of higher education institutions lies not only in the possibility of open and inclusive access to educational services for all categories of the population. Using this approach allows students to develop skills of non-violent interaction in the academic environment, empathy, empathy for the opponent, and personal responsibility. Thus, the academic community is a fertile environment for teaching the younger generation effective communication strategies in the discussion, where all participants in a conflict situation can reach a consensus by awakening compassion for their opponents, operating with critical thinking and applying emotional intelligence. The purposeful development of such qualities increases the level of social reciprocity of both students and teachers.

A Ukrainian scientist (Hladchenko, 2020) proposed a concept of science education based on the principles of social responsibility, inclusiveness, and peacebuilding. This concept represents the reformatting of a strictly deterministic higher education system into a demand-driven, branching system of knowledge generation and dissemination based on the observance of a socially responsible individual trajectory of the educational process. This approach allows students to demonstrate such socially responsible skills as tolerance, curiosity, initiative, mental acuity, creativity, and critical thinking. The transition from standardised knowledge and regulated behaviour to free analytical searching, research, experimental, design and inventive activities under the rules of socially responsible interaction brings modern education closer to real life, and its entrants acquire the sustainable motivation to know themselves through the prism of the complex world.

The opening of Science Education Chairs, Peacebuilding and Social Justice Research Centres, supported by UNESCO, will mobilise and engage the academic power of universities to address existing societal problems in local and global dimensions. Further research into the phenomenon of science education in the context of peacebuilding could be undertaken using sociological verification methods, which would reveal the current level of awareness of research and teaching staff on these issues. Of particular research interest could be the issue of updating the content of future teachers' curricula with regard to ensuring their awareness of the theory of science education and based on their awareness of the role of science education in the civilisational processes of the 21st century.

The historical experience of the relocation of universities from the First and Second World Wars has shown that any evacuation is inherently force majeure, which has a disruptive effect on the teaching and learning process and academic work (Islam et al., 2021). Even a temporary suspension of normal university functioning requires a long period of rehabilitation, which in some cases may take years. The problem of a displaced university has to be seen in the coordinates of two cities – the one from which it evacuated and the one to which it moved. In fact, through relocation one solved not one but two problems simultaneously: on the one hand, saving university property and empire-loyal staff from the enemy, and on the other, reinforcing higher education in the regions to which the university was evacuated. A ramified university organism cannot be relocated in its entirety in the short term - there will always remain a certain proportion capable of self-reproduction over time. In a situation of ideological confrontation, this means that a previously cohesive university splits into distinct parts oriented towards extremely opposite, even antagonistic, attitudes. Reintegration with "their" universities in the occupied territory is currently impossible.

From the perspective of (Oleksiyenko et al., 2021), attempts to return displaced higher education institutions to Ukraine are still only in draft form. No one is waiting for displaced universities there. Rather, it is advisable to talk about the integration of displaced universities into the educational and scientific landscape of Ukraine, which has already passed. But when reintegrating, we should not lose the positive assets of the relocated universities; we should preserve our educational and mental peculiarities, the spirit of "Alma Mater". The ordeal that has befallen our people will make the already strong Donbas and Crimean universities even stronger, more competitive and creative.

In terms of ensuring the social responsibility of higher education on the part of the state, it is necessary to develop and implement a system of resources, information and logistical support for higher education institutions in the new environment (Hladchenko, 2020).

In the absence of a clear state strategy for the development of displaced institutions of higher education and with a lack of funds to strengthen their physical facilities, the question of saving these educational centres and preserving their own identity is in their hands. Success in preserving their own position in an increasingly competitive educational market will depend on the ability of professional teams of displaced educational institutions to offer Ukrainian society and local communities their newest mission of cultural reintegration of Donbas. In this sense, displaced universities have an opportunity to acquire a new role and social significance not only as centres of education and science, but also as centres of culture and social activism, as places of social dialogue, and as innovative platforms for finding strategies for overcoming conflicts between citizens with non-identical, sometimes diffused identities. The development of accompanying services that displaced universities can provide to local communities will transform them from recipients of assistance from government and local authorities into providers of new services and creators of new meanings of contemporary Ukrainian reality. The displaced institutions of higher education continue to perform primarily an educational function. Apart from the standard process of training future highly qualified specialists among Ukrainian youth, in the territories of Donetsk and Luhansk regions, teachers of displaced institutions of higher education have to "fight for the consciousness" of their future students. It should not be forgotten that all displaced institutions of higher education, who have demonstrated their loyalty to Ukraine by their move, are in one way or another not just educational institutions, but also a powerful weapons in the information war against Russian propaganda. It is they who are the rehabilitation centres capable of effectively "sanitising the minds" of locals who are still hostile to the Ukrainian government.

Based on the current state of the Ukrainian educational system, divided by the war, the main way of reintegration is to establish effective support systems for displaced institutions of higher education with improved material, a technical and scientific-pedagogical component of their activities. Thus, the relevant objectives of reintegration policy are: 1) Establishing an effective system for displaced institutions of higher education in their new locations; 2) Expanding and upgrading the logistical, organisational and methodological base of displaced SAIs; 3) Preparing displaced institutions of higher education to return to the liberated territories; 4) Developing and implementing systematic measures to support youth from the occupied territories, encouraging them to join displaced institutions specifically.

Hladchenko, 2020; Knysh et al., 2020; Oleksiyenko et al., 2021 suggest different scenarios for ensuring the socially responsible provision of higher education institutions in situations of military conflict. The use of one scenario or another depends on many factors: the location of the institution, and the presence or end of a military conflict at the current point in time (Ashour, 2022; Ayoubi et al., 2011; Kember et al., 1991).

The «Internal Resources» scenario, for instance, is based on the principle of strengthening the social responsibility of the work of the displaced universities at the expense of the state. This scenario implies that the military conflict is not over and, therefore, universities need to be relocated from the active war zone. Many researchers (Sabzalieva, 2017; Vargas-

Hernández et al., 2016) believe that to ensure social responsibility and quality of educational services provision, active state support of displaced universities by creating nationwide programmes to support them, unifying curricula, introducing best domestic teaching practices, attracting socially responsible teachers with relevant experience is necessary.

The second version of the «International Support» scenario is applicable when active hostilities are over and the support of the international community is needed for higher education institutions to recover (Corbett, 2014; Evans, 2010; Jegede, 1994). The essence of this scenario is to spread the practice of involving international experts, and foreign teachers, adapting foreign experience of ensuring socially responsible provision of education at a high level. This scenario involves the state delegating the tasks of supporting displaced higher education institutions to foreign (international) organisations while retaining control over social responsibility standards and quality of education, planning, monitoring and improving education policy. The scenario envisages organisational and financial assistance to displaced universities by state and non-state foundations.

The third hybrid scenario combines elements of the previous two scenarios. It is applicable if the military conflict has entered the recessionary phase. This approach, in terms of (Kearney et al.,2012) represents, on the one hand, the use of the state institutional structure of social responsibility of providing high-quality educational services to displaced universities, on the other hand, the involvement of material, informational, the methodological capacity of non-state and foreign organisations. From the point of view of (Ganushchak-Yefimenko et al., 2017), the simultaneous use of this scenario can be realised through the use of the methodology of competitive integrative benchmarking of higher education institutions. This approach allows, on the one hand, to find and copy the best practices of international universities to solve similar problems and, on the other hand, to rationally use the resources available to universities.

This requires examining the needs of each individual displaced university and proposing a phased and flexible strategic benchmarking plan. In this scenario, the monitoring of support policies for displaced universities and the objective assessment and rapid adjustment of relevant areas for improvement are of particular importance.

Since the start of the invasion by Russian troops, the educational process in educational institutions of all levels was suspended for a fortnight. During this period, there was a temporary occupation of some territories. According to the United Nations International Children's Emergency Fund (UNICEF), about 7 million people became refugees. Notably, more than half of them were internal migrants, and about 40 percent were external. And the bulk of refugees were women and children. On March 10, 2022, the Ministry of Education and Science of Ukraine (MESU) launched an interactive map with educational institutions in Ukraine destroyed and damaged by Russian actions. As of March 31, 76 educational institutions in Ukraine were completely destroyed, and 722 were damaged (Table 1).

Table 1. State of the Infrastructure of Educational Institutions in Ukraine as of 24.02. – 01.04.2022

Infrastructural facilities for education	Damaged	Destroyed
Pre-primary education establishments	263	7
Secondary and special education establishments	356	61
Establishments providing out-of-school education	17	1
Vocational education establishments	45	5
Vocational higher education establishments	22	1
Higher education establishments	18	1

According to these data, some regions (Kharkiv, Donetsk, Sumy, and Kyiv) accounted for most of the damage to property and buildings of educational institutions. At the same time, this did not prevent the restoration of the educational process since March 14. Classes took place mainly in remote mode. Universities in those regions were able to organise the educational process so that teachers could conduct it from any region. In addition, for those universities where the academic process could not be restored, it was decided to transfer students to universities in Ivano-Frankivsk, Lviv, Ternopil, Rivne, Volyn, Dnipro, and Khmelnitsky regions on the principles of academic mobility. In this respect, the experience of the evacuation of Ukrainian universities in 2014 (Oleksienko et al., 2021), when most of the universities in Donbas and Crimea were relocated to safer areas, should be considered. For instance, it stands to mention moving the Donetsk National University to Vinnitsa, the State Biotechnology University to Transcarpathia, the Volodymyr Dahl East Ukrainian National University to Kamyanets-Podilsky, and the Luhansk Medical University to Rivne. Many EU countries (Lithuania, Latvia, and Estonia) offer scholarships and various academic programs for students and teachers from Ukraine. Moreover, in March 2022, the World Bank allocated 100 million hryvnias to support students. Poland created the Ukrainian Global University project suggesting Ukrainian students, researchers, and teachers to join the programs of foreign universities and institutes. MESU has set up a Telegram bot where news on the employment of scientists and teachers at universities abroad is published.

Elsevier provides Clinical Key, Complete Anatomy and Osmosis electronic platforms for Ukrainian medical professionals. Ukrainian scientists have also been given access to electronic resources that are available as part of the Global Access to Research in health, food and agriculture, environment, innovation and law (Research4Life) project. To summarise, currently, many ideas are offered to realise the possibility of using various technologies to deliver higher education in a socially responsible way. Nevertheless, there is still a need to analyse the effectiveness of different drivers for organising universities on corporate-social principles under wartime conditions.

Thus, the aim of this paper is to find a new tool for clustering the quality of higher education services according to the level of social responsibility achieved. The practical application of this tool will make it possible to determine the effective complementarity of the drivers applied to arrange higher education services on social principles under martial law and propose an approach to identify the activator/deactivator indicators of this process.

3. Methodology

Data collection and development of recommendations on arranging the provision of higher education under martial law was based on open Internet sources, official data of MESU, processing of data of the online survey among higher education stakeholders conducted in the form of a Google table.

The processing of 200 questionnaires made it possible to identify the main indicators affecting the opportunities and stakeholders' perceived expectations to receive higher education under martial law, the costs of universities to ensure this process.

While building a model (M.1) of clustering the quality of higher education services by achieving a level of social responsibility under martial law, the following indicators were used (Table 2).

Table 2. Inputs for building a model for clustering the quality of higher education services according to the level of social responsibility achieved under martial law

Indicators	Designation
Security of higher education provision	x_{11}
Quality of higher education provision in the context of war	x_{12}
Availability of the Internet	x_{13}
Relevance of information and communication technology to the required quality level of higher education provision	x_{14}
Loyalty and trust of stakeholders to the university	x_{15}
Ability to ensure a living wage for the university staff	x_{21}
Need to evacuate the university	x_{22}
Costs of relocating the university	x_{23}
Possibility of obtaining scholarships for students from EU universities	x_{24}
Costs of providing higher education services related to distance working conditions, martial law	x_{25}

The indicators in Table 2 were assessed as follows.

For the indicators that require ranking according to the degree of correspondence of the answer to the required result, the following five-point scale was used: 1 (Difficult to answer); 2 (No); 3 (More likely no); 4 (More likely yes); 5 (Yes). This group of indicators includes:

"Availability of the internet";

"Relevance of information and communication technology to the required quality level of higher education provision";

"Loyalty and trust of stakeholders to the university";

"Ability to ensure a living wage for the university staff";

"Need to evacuate the university";

"Possibility of obtaining scholarships for students from EU universities".

For the indicators requiring ranking by indicator value, a tare on the following five-point scale was used: 1 (Low); 2 (Rather low); 3 (Medium); 4 (Rather high); 5 (High). This group of indicators includes:

"Security of higher education provision";

"Quality of higher education provision in the context of war";

"Costs of relocating the university";

"Costs of providing higher education services related to distance working conditions, martial law".

The methodology has a number of steps and can be divided into two parts (Figure 1).

Figure 1. Building an optimal system to arrange higher education provision under martial law

Model (M.1):

Mathematical modelling of higher education services clustered according to the level of social responsibility achieved under martial law

Step 1. Factor analysis of indicators for clustering higher education services	$M1_{F_i} = \sum_{i=1}^{m} F_i$ m – the number of key factors of higher education services in war situations $F_i = \dfrac{1}{Expl.F_i} \times \sum \left(a_{ij} \times X_{ij} \right)$ *Expl.F$_j$* – factor load of the *i*-th factor; a_{ij} – indicator value X_{ij}; X_{ij} – *ij*- th indicator.
Step 2. Cluster analysis of indicators of social responsibility of higher education services in the context of war	**Making indicators dimensionless:** $z_{ij} = \dfrac{x_{ij} - \bar{x}_j}{S_j}$ Minimizing the standard deviation from the cluster center: $min \; [\sum_{i=1}^{k} \sum x(j) \in S_i \lVert x^{(j)} - \mu \rVert^2 \,]$ where $x^{(j)} \in R^n$; $\mu_i \in R^n$; μ_i– cluster centroid R_i.

Model (M.2):

Mathematical modeling to optimise the provision of higher education under martial law

Step 1. Identification of indicators-activators of the level of social responsibility of higher education services in the context of war	The dendogram is based on $\mu_i = \dfrac{1}{S_i} \sum_{x^{(j)} \in S_i} x^j$ where the cluster centres are recalculated: $\mu_i^{\,step\;t} = \mu_i^{\,step\;t+1}$ *step t* – previous iteration, *step t+1* – current iteration	
Step 2. Building a model for optimising the provision of higher education in a war environment	The maximum problem $f_1(x) = x_1 + x_2 + \ldots + x_n \to max$ $a_{11}x_1 + a_{12}x_2 + \ldots + a_{1n}x_n \leq 1$ $a_{21}x_1 + a_{22}x_2 + \ldots + a_{2n}x_n \leq 1$ $a_{m1}x_1 + a_{m2}x_2 + \ldots + a_{mn}x_n \leq 1$ $x_i \geq 0, (i = 1, 2, \ldots, n)$	The minimum problem $f_2(y) = y_1 + y_2 + \ldots + y_m \to min$ $b_{11}y_1 + b_{12}y_2 + \ldots + b_{m1}y_m \leq 1$ $b_{21}y_1 + b_{22}y_2 + \ldots + b_{m2}y_m \leq 1$ $b_{1n}y_1 + b_{2n}y_2 + \ldots + b_{mn}y_m \leq 1$ $y_j \geq 0, (j = 1, 2, \ldots, m)$
Step 3. Building an optimal system of higher education provision in war settings using the matrix method	The matrix shows the maximum value of the quality indicator for higher education on the OX axis and the minimum value of the process cost indicator on the OY axis. Indicator value for each cluster: $d_i = exp[-\exp(-f_i)]$, where f_i – a standardized value for the strength of the impact of the activator indicator on shaping higher education service delivery in a war context.	

The first model (M.1) represents the clustering of higher education services according to the level of social responsibility achieved under martial law; the second model (M.2) is the mathematical modelling of the optimised provision of higher education under martial law.

4. Empirical results

Building a model for optimising the provision of higher education services by universities under martial law

The results obtained from the factor analysis of the social responsibility level seen in the higher education provision process under martial law are shown in Table 3.

Table 3. Results of factor analysis of indicators of socially responsible higher education processes under martial law (STATISTICA 10 listing)

Variable	Factor Loadings (Unrotated) (data) Extraction: Principal components (Marked loadings are >0,700000)	
	Factor 1	Factor 2
x_{11}	**0,947528**	0,136939
x_{12}	**0,967737**	0,179234
x_{13}	**0,964241**	0,213981
x_{14}	**0,924994**	0,295035
x_{15}	**0,948388**	0,242523
x_{21}	-0,226765	-0,234214
x_{22}	0,296315	**0,741028**
x_{23}	0,478221	0,557436
x_{24}	0,543605	**0,782692**
x_{25}	0,257035	0,185595
Expl.Var	5,248632	1,804293
Prp.Totl	0,524863	0,180429

It may be concluded from Table 3 that 7 of the 10 initial indicators influence the educational process management, namely all 5 indicators of social responsibility seen in the arranging of the educational process and 2 indicators of financial support of the process arrangement.

The results of the cluster analysis of higher education services according to the achieved level of social responsibility under martial law are shown in Figure 2.

With reference to Figure 2, according to the level of social responsibility seen in the arranging of the process of higher education provision under war conditions, all the territories of Ukraine were conditionally divided into 6 clusters. The first cluster includes universities in two territories (Table 4). The universities in this cluster are practically unable to provide higher education services due to either partial occupation of the territory or the destruction of their infrastructure, with an acute need for their evacuation and for students to seek opportunities to study in other universities, including EU countries. These are universities in the Donetsk and Luhansk regions.

Figure 2. Results of the cluster analysis of higher education services listed by level of social responsibility under martial law
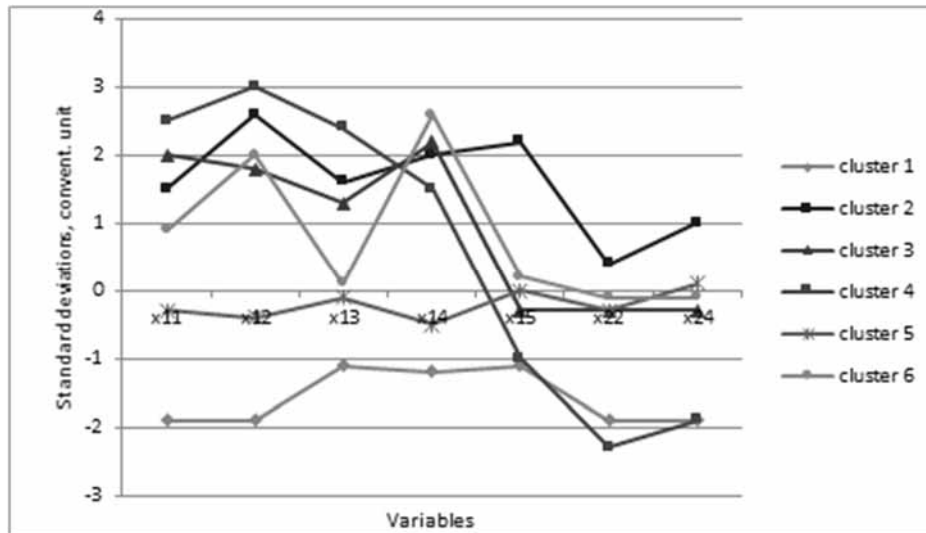
Table 4. Member of cluster number 1 (Data) and distances from respective cluster center (cluster contains 2 cases)

Territory designation	Distance
T5	42498.50
T10	42498.50

The second cluster includes 7 territories (Table 5). Universities in this cluster are able to render higher education services at a sufficiently high level. There is no need for evacuation due to the proximity to the borders with EU countries, and there is no need for students to seek scholarships from EU universities to continue their education. This refers to universities in Lviv, Transcarpathian, Chernivtsi, Ivano-Frankivsk, Volyn, Rivne, and Ternopil regions.

Table 5. Member of cluster number 2 (Data) and distances from respective cluster centre (cluster contains 7 cases)

Territory designation	Distance
T3	41753.37
T4	63385.22
T6	43660.66
T7	64022.66
T13	41092.58
T16	48878.08
T22	58989.92

The third and fourth clusters each include one territory. Kyiv's universities are in the third cluster, characterised by a high level of educational services and stable financial and logistics

systems. The fourth cluster includes universities in the Kharkiv region. The system of higher education provision is disrupted by the destruction of buildings and the flight of students and teachers. The fifth cluster includes 10 territories (Table 6). These are Dnipro, Zaporizhzhia, Cherkasy, Kirovograd, Mykolayiv, Odessa, Poltava, Sumy, Kherson, Chernihiv regions. Universities in these territories are placed in a rather precarious situation, as there is a high probability of evacuation of the universities, most of the students and teachers have been forced to evacuate, and arranging of the educational process is troublesome.

Table 6. Member of cluster number 5 (Data) and distances from respective cluster centre (cluster contains 10 cases)

Territory designation	Distance
T1	71093.40
T9	54320.09
T12	74096.78
T14	34944.56
T15	19654.88
T17	35077.18
T18	53264.77
T20	50732.63
T21	24598.43
T23	39132.25

The sixth cluster includes four territories (Table 7). These are universities in Ternopil, Khmelnitsk, Zhitomir, and Vinnytsia regions. According to Figure 2, the universities in this cluster are able to provide higher education services at a high level (indicator value x12), the level of information and communication technology provision meets the required quality of higher education provision (indicator value x14), the security of higher education provision (indicator value x11) is at a high level. The value of indicator x11 indicates that there is no need to evacuate these universities (mainly due to their territorial location in the centre of Ukraine). The high level of these indicators indicates that these universities are able to provide a sufficiently high level of social responsibility both to the students (safety and reliability of educational services) and to the teachers (teachers receive a stable salary).

Table 7. Member of cluster number 6 (Data) and distances from respective cluster centre (cluster contains 4 cases)

Territory designation	Distance
T11	40220.75
T19	52693.36
T24	15579.71
T25	34349.82

Preliminary testing of the proposed model relied on the data from open Internet sources, official data of MESU, and processing of data of the online survey of higher education stakeholders conducted as a Google table using the STATISTICA 13 program. As a result, a model for optimising the arranging of higher education provision under martial law was derived based on the principles of maximisation. This means that its solution is at the saddle point for each group of higher education institutions in a particular cluster. The quality and

social responsibility of the provision of educational services is maximised, while the cost of providing them is minimised. Putting this another way, the maximisation function was constructed on the basis of the data in Table 3. It reflects most of the educational processes - the variance value is 52.49% using Eq. 1.

$$\mathbf{f_{1(x)}} = {}^{\mathbf{1}}\!/_{\mathbf{5,248}} \times (\mathbf{0,948}x_{11} + \mathbf{0,968}x_{12} + \mathbf{0,964}x_{13} + \mathbf{0,925}x_{14} + \mathbf{0,948}x_{15}) \rightarrow \mathbf{max} \quad (1)$$

The minimisation function reflects the ability to minimise the costs of providing educational processes - the variance is 18.04% using Eq. 2.

$$f_{2(x)} = {}^{\mathbf{1}}\!/_{\mathbf{1,8}} \times (\mathbf{0,741}x_{22} + \mathbf{0,783}x_{24}) \rightarrow min \quad (2)$$

The results of the identification of indicators-activators of social responsibility of higher education services in the context of war by means of a dendogram are presented in Figure 3.

Figure 3. Dendogram of identification of indicators-activators of social responsibility of higher education services in war situations (STATISTICA 13 listing)
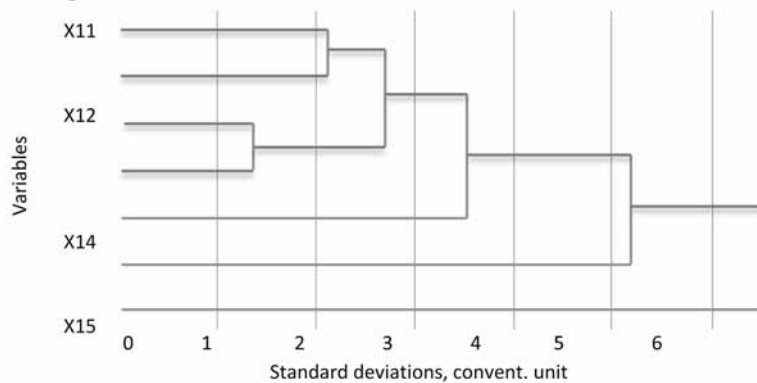
These dendograms allow for the visualisation and identification of activator indicators of social responsibility of higher education services in war situations.

The first model (M.1) can be used as a tool for clustering higher education services in war. This model continues the theoretical developments presented by Sultana, 2012, Tight, 2015, Van Rooij, 2012, Ganushchak-Yefimenko et al., 2017, and Zhuravka et al., 2021 in key aspects.

The use of the methodological components of the second model made it possible to construct a matrix of exit strategies from crisis situations, maintaining the level of social responsibility achieved and the quality of educational services provided by higher education institutions under martial law (Figure 4).

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Figure 4

Matrix of university exit strategies, maintaining the achieved level of social responsibility and the quality of educational services provided by higher education institutions under martial law
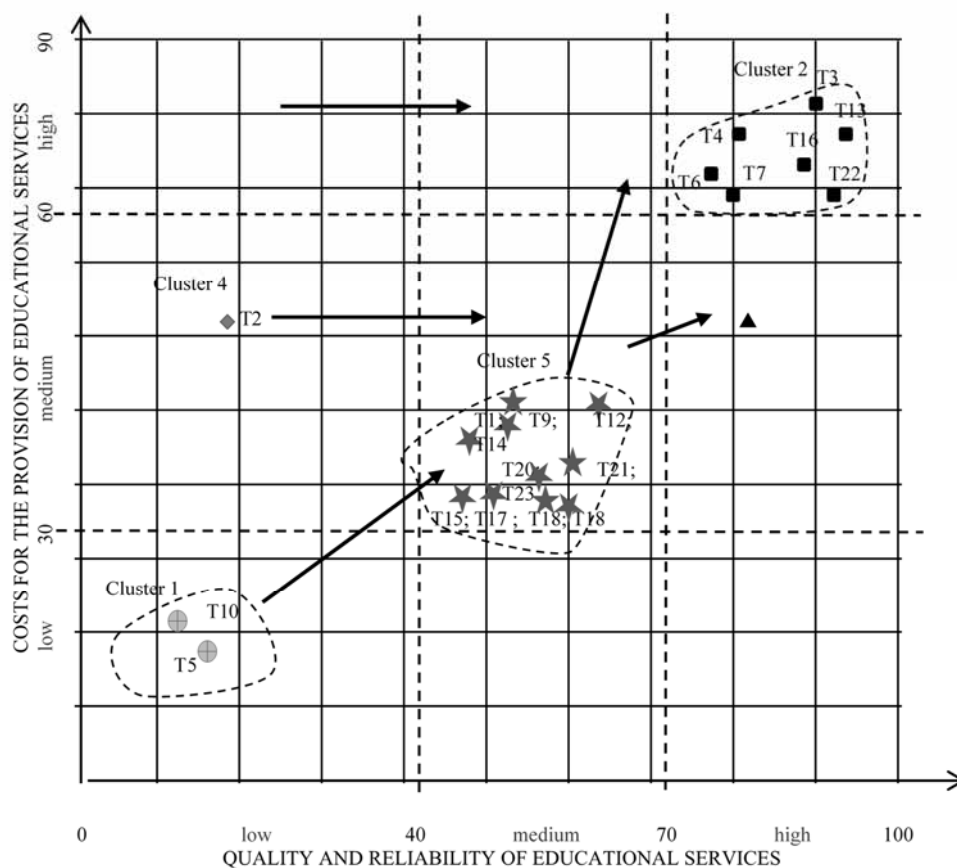
Thus, the views outlined by Abou El-Seoud et al., 2014, Babu et al., 2018, and Bezhovski et al., 2016 as for indicator x13 Internet Accessibility being the most significant in the organisation of higher education service delivery in crisis conditions are confirmed. In other words, the named indicator is the driver of this process in order to ensure the management of educational services in war conditions.

In order to build a matrix to optimise the system of provision of educational services in conditions of war, it is proposed to place a driver indicator for minimising logistical costs on the axis of EI. As shown in Fig. 4, this driver is indicator x22 Need to evacuate the university. This assessment refutes the views cited by Beaudoin, 2016 and Bernard et al., 2009 that indicator x25 Costs of providing educational services related to distance working conditions,

martial law can be an activator indicator for reducing costs of providing higher education services in crisis or martial law situations. Nor are the views presented by Brennan, 2018 and Corbett, 2014 that indicator x14 Compliance of information and communication technology with the required level of quality of higher education services may be a driver of this process. In doing so, the opinion presented by Evans, 2010 is supported. Indeed, the strength of the influence of indicators x12 Quality of higher education services under war conditions and x15 Loyalty, trust of stakeholders to a given university, firstly, does not exceed 10-15 percent of the total assessment of the provision of the educational process under war conditions; secondly, it reflects the essence of stakeholders' trust in the higher education system under these conditions in general. The strength of the influence of the activator indicators in the crisis exit strategy development matrix is not equal. Indeed, x11 Security of provision of higher education services simultaneously with ensuring the necessary level of their quality as drivers of the provision of educational processes is almost three times as significant as drivers of expenditure. This confirms the views cited by Green et al., 2010 and Hladchenko, 2020. And the role of indicator x21 Ability to provide living wages to university staff as a possible driver of social responsibility of teachers to stakeholders confirms the point stated in Islam et al., 2021.

Figure 4 shows that the integral indicator on the axis OX "Quality and reliability of educational services" reflects the qualitative component of social responsibility for the provision of educational services. The integral index on the axis "Costs for the provision of educational services" reflects the resource provision of support for social responsibility for the provision of educational services. Both axes visualise the division into 3 gradations: low; medium; high. The 9 quadrants in the matrix field clearly reflect the situation of universities at the current point in time. The arrows indicate the direction and options for exiting or improving the situation of socially responsible educational services.

Thus, as universities in cluster 1 are in the quadrant of low level of social responsibility and quality of educational services provision, it could be recommended for them to evacuate the universities or, if this is not possible, to search for student academic mobility options in EU or Ukrainian universities.

Universities in cluster number 2 are in the quadrant of high social responsibility and quality of educational provision. Therefore, a retention strategy can be recommended for them.

Universities in the Kyiv region cluster number 3 are in the quadrant of high quality of educational services provision and medium level of social responsibility. Therefore, a retention strategy can be recommended for them to maintain the achieved positions of quality of service provision and, at the same time, to increase the level of social responsibility both to students and to teachers.

Universities in cluster 4 (Kharkiv region) found themselves in the medium-quality quadrant of educational service provision, as they were able to convert almost all universities to distance education. At the same time, the threat of university evacuation remains high. Therefore, it is recommended for universities in this region to continue enhancing social responsibility by combining different forms of educational provision.

Universities in cluster 5 (Dnipro, Zaporizhzhia, Kirovograd, Mykolaiv, Odessa, Poltava, Sumy, Kherson, Cherkassy, Chernigov regions) are in the quadrant corresponding to the medium level of quality and social responsibility This is due to the fact that the organisation of educational process is difficult, so the quality of educational services is at an average level. For this quadrant it is recommended to improve the organisation of the educational process.

Universities in cluster 6 (universities in Donetsk and Luhansk oblasts) are in the quadrant with a low level of quality and social responsibility of the services provided. This is due to the fact that they are practically unable to provide higher education services due to either partial occupation of the territory or due to the destruction of their infrastructure, with a high need for their evacuation and for students to seek opportunities to study in other universities, including EU countries.

Testing of the proposed model (M.2) for optimising the provision of higher education under martial law suggests that the basic assumptions of the model are correct. In order to compare the results obtained by Jegede, 1994, it is necessary to test the model to predict the feasibility of practical strategies for optimising the delivery of educational services. What is meant here is an urgent need for the further re-study in this area. This is especially true as hostilities are ongoing and the stressful effects of war will be felt for a long time to come. Therefore, the proposed models will need to be tested again, taking into account the ongoing changes in the country's higher education system as a whole. At the same time, one should consider a number of limitations. For instance, to find the most effective solutions to optimise service provision not only for the higher education system, but also for all other levels of education, especially when it comes to hybrid educational information technologies. This will provide means for testing the point of view on the possibility of scenario behaviour in such a situation suggested in Kolodiziev et al., 2014. Consequently, to obtain more comprehensive results of the impact of the educational service delivery process on all spheres of society, increasing its social responsibility, on the one hand, the scope and tools of the study should be expanded, and on the other hand, the set of model indicators could be expanded.

5. Concluding Remarks

The article proposes a new scientific and practical approach to enhance the social responsibility of higher education process management under wartime conditions. The methodology consists of the consecutive use of two models. The first model allows the clustering of higher education services by the achieved level of social responsibility under wartime conditions. It consists of two consecutive actions, namely factor analysis of educational services to identify drivers and cluster analysis of higher education services by the achieved level of social responsibility. The first iteration of the second model is the construction of a dendogram. Its visualisation provides means for identifying complementary sets of driver indicators of arranging the educational process.

The research and testing of the developed models allow us to state that the aim of the article has been achieved. Namely, the use of the developed approach makes it possible to optimise the system of higher education service provision in terms of quality and social responsibility under martial law.

The proposed models have been preliminarily tested on the basis of open Internet sources, official data of MESU, and processing of data obtained from the online survey of higher education stakeholders conducted in the form of a Google table. This allowed ranking of all territories of Ukraine by the level of security, quality of higher education services, and costs of their provision on the principles of social responsibility, in particular, to identify points of growth, stabilisation, and degradation. The use of the dendogram made it possible to identify activator indicators of quality, security of higher education services, and costs of their provision under martial law. It is assumed that 7 of the 10 indicators affect the provision of the educational process. The deactivator indicators were not included in the model. At the same time, the drivers of quality and accessibility of educational services are almost three times more significant than the drivers of logistical costs. A clear differentiation of all indicators into activators/deactivators would allow higher education institutions (HEIs) in Ukraine to develop a long-term strategy and short-term measures to increase the level of social responsibility to all categories of stakeholders. Consequently, an urgent question is whether HEIs will be able to continue using these models to increase the level of social and technical accountability of higher education provision to all stakeholders. This will enable HEIs to maintain and develop their key competitive advantages when operating under martial law.

The use of the developed methodology of identifying driver indicators, and building a matrix of logistic strategies for exiting crisis situations with their help will increase stakeholder loyalty by 13%; improve the quality and reliability of educational services by 10%; identify points of growth and stabilisation by at least 15-20%. Clustering the logistics of educational services according to the achieved level of social responsibility under martial law revealed 6 clusters. The system of higher education services, depending on the level of social responsibility of universities under martial law, was optimised using two functions, namely maximising the quality and safety of the educational process and minimising the cost of providing educational services.

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NEEDED SUPPORT FOR FEMALE PRIVATE FOREST OWNERS (SOME RESULTS OF A SURVEY OF DANUBE COUNTRIES)[4]

The aim of the study is to identify needed support for increasing the productivity of private forestry, focusing on the decision-making process in the case of women – private forestry owners in countries of the Danube region. The data used is from a survey in the frame of the project "Forest in Women's Hands".

The methods applied are Regression Ordinary Least Squires (OLS) model and logistic regressions. Statistical correlations are measured to check the impact of some factors affecting female management decisions in turn to outline the needed support.

The results, along with others, show that women involve friends, family members, and spouses in the forest to support them in decision-making, but the requested support is not directed explicitly to increasing productivity. The support provided by the forest associations and government institutions is not effective enough for forest utilisation and productivity. The conclusion that could be drawn is that the needed support is training the private female owners. On the other hand, the study identifies some differences between countries with prevailing private ownership and others.

Keywords: Female forest owners; questionnaire; forest management; decision-making
JEL: M11; Q23

1. Introduction

According to data from Eurostat, the EU accounts for almost 5% of the total forests in the world by calculating 159 million hectares of forests (Eurostat, 2022). For the countries in the Danube Region, the share of forest cover is between 30% and 63% (Georgieva et al., 2021, p. 286). In 2019 the Gross value added of the forestry and logging industry represented 0.18

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% of the EU GDP, which according to Eurostat data, is 15 % less than the share in 2000 (Eurostat, 2020). The loss of competitiveness is considered by Chobanova (2016, p. 61) as a factor leading to some negative consequences, such as slowing down the economic growth and inefficient use of timber in a country.

Women's participation in forestry is seen as a factor in improving governance, sustainable use and management of forests, and enhancing livelihood benefits and opportunities (Coleman, Mwangi, 2013, p. 193). They have an important role in forest protection and sustainable forest management (Nhem, Lee, 2019, p. 106). For the purposes of utilisation and sustainability, forestry ownership has a significant impact (Weiss et al., 2019). The link between ownership and forest management is essential for improving competitiveness and economic productivity in forestry. However, female participation in forestry could be divided into:

(1) female professionals who work in the sector – as administrators, managers, foresters and etc.;

(2) female professionals who work in the sector and own private forests;

(3) female who has a private forest but has no professional background in the field of forestry.

Those target groups have differences in their managerial behaviour primarily related to the knowledge and skills they have from their professional forestry background. Without belittling the importance of specific forest knowledge, the main target group of the present research is females owning a private forest without having a professional background and, thus, specific utilisation skills. The main focus is to outline some key factors affecting women who have private forests when they take a decision related to the management of the land and its utilisation. Even though the theme is not new, there is not much research related to female management of private forests, especially in some of the Danube region countries like Bulgaria, where there is no data for a previous study in the field.

In terms of ownership of Europe's forests, about 53.5% are public, while 46.5% are private forests. Most of the private forests are small-scale of size class from 11 to 500 ha. (Forest Europe, 2020). There is a distinction between public (state and municipal forests) and privately owned forests (by individuals and legal persons such as churches, NGOs, and communities) in Danube Region countries (see Figure 1). Bavaria (Germany), Slovenia, and Austria are the only countries showing data that the bulk of the forests is privately owned.

The data from the project does not meet the reliability criteria to be used for the assumption of state-of-the-art conclusions. However, this data could be used to identify new problems in the sector. The common ones that concern managers are market prices, land-owner type, bequest motives, forest property size, environmental preferences, and management objectives.

Figure 1. Share of public and private forests in countries in the Danube Region, 2021 (%)
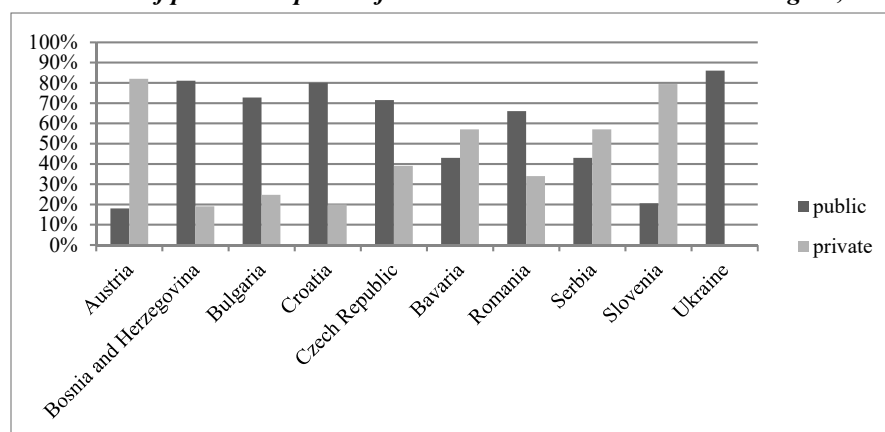
Source: Bavarian State Ministry of Agriculture, Food and Forestry (StMELF), 2021; Hastreiter, H., 2020; Ministry of Agriculture, Water Management and Forestry of the Federation of Bosnia and Herzegovina; Executive Forest Agency in Bulgaria; Eurostat; National Strategy for Development of the Forest Sector 2013-2020; SFS, 2021; State Agency of Forest Resources of Ukraine, 2021; RAS; National Institute of Statistics of Romania, 2021; General Forest Management Plan of Croatia; Croatian Bureau of Statistics; State Administration of Land Surveying and Cadastre in the Czech Republic; UNECE, 2020; UNECE, 2018.

There is no official data in some of the Danube Region countries, regarding the share of female forest owners. Some assumptions could be drawn taking into account the ownership structure by countries (see Figure 1):

- There is a distinction between public and privately owned forests in the analysed countries. The public includes state and municipal forests, while private forests are owned by individuals and legal entities such as churches, NGOs, cooperatives and etc. The data show that the majority of the forest lands are public, and particularly state-owned forests (which is prevalent in many former socialist countries).

- The bulk of forests in Slovenia and Austria are privately owned. In Romania and Serbia, the process of restituting public forests to private entities was less transformational. There, however, logging and wood processing have to turn into key economic activities in rural areas. In the Czech Republic, the church has become a major beneficiary of forest restitution, while private individuals own 17.5%.

- In the Danube Region, the privatisation of forests affects the nature of work in the forest sector. This, in hand, reflects to the decision-making process and the needed support from internal and external factors. The changes he management (public management reforms, ecosystem-based management and etc.) have changed the way male and female are engaged in it and work with forests and forestry.

These assumptions have a significant impact on women owning forests as the private forest land is less and mostly small-scale. In some Danube countries, like Bulgaria, the forests are fragmented which is an additional obstacle to female wanting to manage forests and live near big cities.

Taking the above considerations naps country expects opinion, according to recent project data (Georgieva et al., 2021, p. 293), the share of women owning private forests in some of the Danube countries is highest in Slovenia (35%), followed by Bavaria (31%), Czech Republic (30%) and Austria (23%). The presented data is based on official data from the Eurostat, Statistical institutions of the targeted countries, and own calculations of the project team members from reliable national sources such as Public reports of the State Agencies and other official reports. Female forest owners in those countries have smaller parcels of forests, primarily between 1 and 2 ha up to 5 ha. Still, the sector is considered male-dominated, which negatively affects female participation in it (Georgieva et al., 2021). Lower participation of women in forestry is confirmed in other European countries, including Bulgaria as well (Food and agriculture organisation of the United Nations, 2006, p. 13). However, the stated studies focus only on female professional participation, gender equality issues, and the motivation for working in forest administration (legal, social and economic) and they are not focused on female private forest management.

According to Eggers et al. (2014, p. 1696), "an increase in the share of female forest owners could lead to a change in forest management". According to the same authors, the size of the forest is the most important factor in terms of management strategy. In this respect, improving women's participation in forestry and supporting the more active role of female forest owners, could improve the competitiveness of the forest-based sector. Males and female forest owners have different values and opinions in terms of forest decision-making and business income opportunities (Umaerus et al., 2019). This makes the question regarding the factors influencing female forest utilisation and managerial decisions still debatable.

The main goal of the study is to outline and analyse some factors (in terms of involved stakeholders and needed tangible and intangible support) that affect women's ownership, which has a key role in forest utilisation and managerial decisions. The subject of the analysis is female – private forest owners in some countries in the Danube Region, more precisely – Slovenia, Austria, Croatia, Czech Republic, Bulgaria, and Bavaria (Germany). The adopted research methods are logical, deductive, and comparative methods. Primary data is presented from the Fem4Forest project with information from online questionnaires. The main authors' hypothesis is that throughout a combination of external and internal factors, women are more engaged in decision-making when it comes to the utilisation and productivity of their forest as forest owners. Even though the support of relatives and friends has influence over women's decisions, it has not had a significant impact in terms of forest management. As main female managerial goals are harvesting, recreation and scientific use of the forests. The main research tasks are:

- To outline specific internal and external factors affecting the managerial decisions of women in terms of forest productivity and utilisation.

- Throughout the use of the Regression Ordinary Least Squires (OLS) model and logistic regressions to check the statistical relationships between the selected factors and the managerial decisions of women to utilise their forests.

The logical construction of the study begins with a literature review related to some internal and external factors affecting forest management, where specific variables are outlined. The

articles continue by presenting information on the methodology used, collected data, results, and conclusions.

2. Literature Review

Managerial decisions of the private forest owners depend mainly on factors related to market prices, land-owner type, bequest motives, forest property size, environmental preferences, and management objectives. In addition, socio-demographic and forest management characteristics as cited as factors influencing forest management (Kuuluvainen et al., 1996; Novais, Canadas, 2010; Poje et al., 2016). According to Beach et al. (2005), there are four main categories influencing forest management behaviour-market drivers (where timber price has the most influence), policy variables (regulatory instruments and information), owner characteristics (income, education level, age, and owner proximity), and plot and resource conditions (property size and growing stock). It is believed that younger forest owners are more active when managing their forest (Lidestav, Ekström, 2000) as well as those who have bought it rather than inherited it (Eriksson, 2008). However, newly forest owners have less education and skills related to forest management and because of that, they outsource the forest work to companies or become members of forest owners' associations (UNECE, 2018).

The objective of owning the forest, financial and technical support to the implementation of innovative practices, the existence of illegal logging practices in the region, inheritance laws, information and advisory programs, and fragmentation of forests could also be stated as factors for the managerial decisions as well (UNECE, 2018). In this respect, recreation, family legacy, and nature protection are cited by some researchers as the main goals of the forest owners of small-scale forests (Eggers et al., 2014).

There are cases where the original forest owners, who got back their forest land, have issues carrying out the forest operations. In such cases, most of the forest operations in timber harvesting are carried out by contractors (Ambrušová, Šulek, 2014, p. 177). Such a possibility should not be neglected as it is a way of forest management as well. Furthermore, medium to large-private forest owners are usually outsourcing the management of their forests. According to Georgieva (2022), women often rely on the support provided by their family, close friends, and neighbours, rather than from experts, government institutions, and NGOs when it comes to managing their forests.

Taking into account the fact that the topic is still highly debated and without neglecting all factors having an impact on female forest management, the following factors will be more in-depth analysed in the current study:

- External and internal stakeholders affect the decision-making process of female private forest owners. For the purposes of the internal stakeholders, the ones with the strongest impact are chosen to be family members, husband (partner), and close friends. As external ones are – foresters of state forest administration, private foresters or forest professionals, and experts from forest associations or non-profit organisations.

- Needed support in terms of effective management of the forest by female private forest owners. In this respect, the following kind of support is under analyses that have a direct and indirect impact on the productivity and utilisation of forests – information and know-how (training, literature), used machinery, people to help with manual work, government funding, forest contractors, used networks, used information from Internet/social media, motivation, and support that comes from female role models, the knowledge offered by forest experts.

3. Used Methodology and Data Collection

Before the start of data collection, a methodology for identifying the target groups and their needs regarding effective and efficient forest management was made. The methodology is based on (1) country reports and (2) in-deep interviews and focuses group surveys. Based on the country reports, an overall picture of the situation in each country was presented that includes data for the land ownership, the share of women in the sector, forest-focused interest groups, public and private forest management, labour market, education, training, and initiatives supporting women participation in forestry (Georgieva et al., 2021). The second part of the methodology is based on the results and summarised key findings from the in-depth interviews with women forest owners and professionals, and an overview of the stakeholder roundtables made in each project's Danube country (Krajnc et al. 2021). Based on the stated data and project outcomes, a questionnaire for checking the hypothesis was developed and distributed among the target groups in the Danube countries under analysis. The following information presents some results of the mentioned questionaries' survey.

3.1. Data collection

To identify female forest participation as female private forest owners and motivation for managerial decisions, an online survey was conducted using The Lime Survey tool. It is a part of the collection data activities related to the Fem4Forest project (DTP3-500-1.2 Fem4Forest). The survey was carried out during 22 March – 15 April 2021 based on snowball sampling. The target group is female private forest owners from the countries Austria, Bosnia and Herzegovina, Bulgaria, Croatia, the Czech Republic, Germany (Bavaria), Romania, Serbia, Slovenia, and Ukraine. However, for the purposes of the current study, only countries from the EU were selected for further analysis. The questionnaire used has five main sections related to:

- Socio-demographic data;
- Views of women regarding female participation in the sector;
- Forest condition and status;
- Forest use and management;
- Training needs and interests.

The collected data contains 185 answered questionnaires from female private forest owners. Taking into account the study limitations (only EU countries in the Danube Region to be a target group), 171 are the final number of analysed questionnaires. However, the demographic distribution of the female participating in the survey is uneven. The majority of female owners own less than 10 ha of forest land. Primarily women have inherited their forests or have them as a gift, which is very common in Austria, Bulgaria, and Germany. The majority of the respondents can be described as young as they were born between 1980 and 1999. Still, in some countries (like Bulgaria), female forest owners are mainly in the age group between 60 and 75.

3.2. Regression Ordinary Least Squires (OLS) model for harvesting as utilisation of self-owned forests

The present study uses a multifactor linear model to analyse the impact of different elements of forest management on their productivity. From data derived throughout the conducted survey, dichotomous variables were used as explanatory variables and the annual harvesting of round wood as a continuous dependent variable. As Abdullahi et al. (2015), multiple regression models are frequently implemented in different aspects of life. Similar to Næsset (2007), Bintang et al. (2001) and Ferede (2020) in the study was used multiple linear regression with dummy variables. It is very suitable for the data available and directly reflects the answers in the questionnaire. The model is following:

$$y_i = \sum_{j=1}^{15} \beta_j D_{i,j} + \beta_0 + e_i, \tag{1}$$

where:

y_i is the observation i for harvested m^3 round wood per 1 ha during the last 5 years;

βj – the regression coefficient for each dummy variable D_j;

e_i – the error term for each observation.

The dependent variable (y_i) presents the productivity that women in the sample achieved for the period of 5 years up to the moment of doing the questionnaire. The number of explanatory variables is 15. Form all the questions were chosen these with two discrete answers Yes or No, which avoids the restrictive requirement of equal spacing of levels of the independent variables (Oyeka, Nwankwo, 2012) if any ordinal variables are used. The questions in the survey that are included as explanatory variables, in fact, are among the ones that directly explain the motivation factors and support, that women who participated in the questionnaire received from their families, friends, etc. A list of variables is presented in Table 1.

The first six variables (D_1-D_6) present the personal involvement in forest management of any relatives, friends, and professionals. This kind of support defines the motivation that appeared in women through sharing problems with somebody or taking the advice they need. The statistical significance of these six variables reveals the social environment of women in the sample that facilitates decisions. Dummies from 7 to 15 (D_7-D_{15}) describe the external factors of support. The significance of each of them reveals the resources that women use in order to increase harvesting or another purpose of forest utilisation they have chosen.

Table 1. List of dummy variables D_j included in the model (1)

Variable number j	Question from the questionnaire presented by the variable	Answer and coding
1	Who do you involve when making decisions on your forest? [My husband/partner]	[My husband/partner]=1, otherwise 0
2	Who do you involve when making decisions on your forest? [Male family members]	[Male family members]=1, otherwise 0
3	Who do you involve when making decisions on your forest? [Family and friends (female, male)]	[Family and friends (female, male)]=1, otherwise 0
4	Who do you involve when making decisions on your forest? [Forester of state forest administration]	[Forester of state forest administration]=1, otherwise 0
5	Who do you involve when making decisions on your forest? [Private forester or Forest professional]	[Private forester or Forest professional]=1, otherwise 0
6	Who do you involve when making decisions on your forest? [Forest owner association]	[Forest owner association]=1, otherwise 0
7	What kind of support would you opt for when managing your forest? [Information and know how (trainings, literature)]	[Information and know how (trainings, literature)]=1, otherwise 0
8	What kind of support would you opt for when managing your forest? [Machinery]	[Machinery]=1,
9	What kind of support would you opt for when managing your forest? [People to help with manual work]	[People to help with manual work]=1, otherwise 0
10	What kind of support would you opt for when managing your forest? [Government funding]	[Government funding]=1, otherwise 0
11	What kind of support would you opt for when managing your forest? [Forest contractors]	[Forest contractors]=1, otherwise 0
12	What kind of support would you opt for when managing your forest? [Networks]	[Networks]=1, otherwise 0
13	What kind of support would you opt for when managing your forest? [Internet/social media]	[Internet/social media]=1, otherwise 0
14	What kind of support would you opt for when managing your forest? [Female role models]	[Female role models]=1, otherwise 0
15	What kind of support would you opt for when managing your forest? [Experts]	[Experts]=1, otherwise 0

Source: data from Fem4Forest project.

3.3. Regression model for utilisation choice of owned forests

The previous regression model presents the external factors to maintain the harvesting-like type of utilisation. Internal factors like the personal understanding of how other important are types of utilisation like recreation, hunting, nature conservation etc. In the manner of Rasool & Al-Zwainy (2016) in the study were combined two approaches in analysing the productivity factors – multinomial logistic regression for nominal outcomes and individual logistic regressions for each outcome. In this way, there could be estimated a model for statistically every significant variable from the multinomial logistic model.

The multinomial logistic model (MLM) is in the following double logarithmic form (Stamelos, 2003):

$$ln\left(\frac{prob(category\ j)}{prob(category\ q)}\right) = b_0^j + \sum_{i=1}^{m} b_i^j D_i, \tag{2}$$

where:

j is the index of each category in nominal outcome (dependent variable);

b_I^j – the individual regression coefficient for category j of dummy variable I;

m – number of variables.

By q is denoted the basic event or outcome that other outcomes compare to.

In equation (3) again are used the variables – expressed in Table 1. The dependent variables include answers of the question "Please specify for which purposes you are using your forest" – Rank1, which is part of the questionnaire used in the survey. By this way, women who participated in the survey define the most important purpose for utilisation of their forests. Following possible events (E) can occur:

- Harvesting/Selling timber: E_1

- Timber and/or Fuel wood for own use: E_2

- Nature conservation: E_3

- Recreation: E_4

- Other: E_5

- Hunting: E_6

4. Results and Discussions

4.1. Preliminary analysis of data

All the data in the questionnaire that are used for regression estimation have been preliminary summarised and described in order to reveal the structure of the answers. It is useful to understand the share of women who have given positive answers (Table 2).

The table shows that with the largest relative share in personal support, women meet in their spouses/partners. The least important for the women are "Forest owner association" and the "Private forester or Forest professional". The most important external help sources are "Information and know-how", "People to help with manual work", and "Government funding".

Considering each country, the shares vary significantly for some of the categories. For Slovenian women, husband and forest administration are reliable and highly involved factors in forest management. This is the only country on the list in which the family is not so important for the forest management of women in favour of state forest administration.

Table 2. Factors affecting female private forest management decisions (%)

	In all countries	Slovenia (n=38)	Austria (n=67)	Croatia (n=6)	Czech Rep. (n=18)	Bulgaria (n=9)	Germany (n=33)
My husband/partner	52.05	63.16	52.24	33.33	50.00	33.33	48.48
Male family members	23.98	23.68	26.87	16.67	22.22	11.11	24.24
Family and friends	21.05	7.89	25.37	16.67	22.22	33.33	24.24
Forester of state forest administration	35.67	63.16	23.88	33.33	38.89	22.22	30.30
Private forester or Forest professional	20.47	10.53	28.36	16.67	22.22	11.11	18.18
Forest owner association	15.79	0.00	16.42	16.67	0.00	0.00	45.45
Information and know-how	48.54	34.21	67.16	16.67	11.11	22.22	60.61
Machinery	32.16	39.47	34.33	16.67	33.33	11.11	27.27
People to help with manual work	47.37	47.37	55.22	33.33	66.67	22.22	30.30
Government funding	49.12	52.63	44.78	16.67	50.00	22.22	66.67
Forest contractors	31.58	28.95	34.33	66.67	22.22	11.11	33.33
Networks	18.71	5.26	25.37	50.00	16.67	0.00	21.21
Internet/social media	4.09	2.63	5.97	0.00	0.00	0.00	6.06
Female role models	8.77	5.26	10.45	33.33	0.00	0.00	12.12
Experts	23.98	7.89	35.82	16.67	16.67	11.11	27.27

Source: Own calculations, Based on FEM4FOREST survey data.

Austrian women, as the greatest part of the sample, define the level of husband/partner involvement. For them, the most important are information and knowledge. Austrian women do not rely on forest state administration, but they are likely to steer their forests with a more personal role - as a management style. This, along with husband participation, is a profile of a leader. Austrian women combine resources by themselves – they involve government funding, information, work, and machinery until other women do it through the help of something or someone. They use experts the most among the countries.

Croatian women involve husbands at the same level as forest state administration. They, like Austrian ones, seem to rely on themselves for the decisions. Maybe this is the reason Croatian women to use "Female role models" as an important factor for support. Croatian women participate in networks and enter into contracts with forest contractors. They seem to be the leader in decisions, but do not organise the factor of production in the manner the Austrian or Slovenian women do.

Czech women rely on their husbands more than Croatian, Bulgarian and German ones. They do not use such information or know-how. Maybe they are among the conservative women in the sample – they combine labour, funding, and machinery with less knowledge. Czech women do not use female roles in management as a model for behaviour or management.

Bulgarian women do involve neither any associations nor networks. These women rely on their husbands and families. The most important to them is to find people to work in forests and funding to pay for these people in collaboration with the forest administration. Some of them enter into contracts for harvesting and steering the forests.

Women in Germany involve their spouses for personal help. They use knowledge and funding. The forest management of German women relies on innovativeness and financial resources for that. After the Croatian ones, German women owners of forests use female role models for inspiration. They, in difference from other respondents, are more collaborative in the meaning of forest associations.

4.2. Results for OLS regression

The model in expression (1) is implemented under the constraint of participants harvesting. All the participants with zero (0) harvesting have been excluded. The logic behind this is that if a certain respondent has not harvested any quantities in the last five years, there should be a reason for that. The model will present the results for non-productive forests if all these zero records are included in the model. In order to clarify the productivity factors among the answers in the questionnaire, only positive nonzero records are included. The number of records is slightly reduced and is following:

- Slovenia   – 38
- Austria   – 65
- Croatia   – 2
- Czech Rep.   – 18
- Bulgaria   – 4
- Germany   – 30

Results for model (1) of linear OLS regression are presented in Table 3. There is no multicollinearity presented.

The results presented in the table show that the combined action of the factors is not statistically significant. Breusch-Pagan's (Halunga et al., 2017) test for heteroscedasticity presents Prob > F = 0.52, which means the results are homoscedastic. The only factor that has statistical significance is "Forest owner association" (p=0.048).

It was interesting that the influence of this factor has not contributed to the increment of harvesting volumes. It influences the harvesting in a negative direction. The reasons for this could be various and from the data available is not possible to make hard concussions about them. We can only place a hypothesis that these associations are more focused on forest preservation, but not on harvesting. In order to clarify the individual influence of forest associations, we examined individual OLS regression with individual explanatory variables. Table 4 presents the results.

The model in Table 4 slightly corrected the coefficient for "Forest owner association" from -30.94 to -23.94. The meaning of it is that inclusion in associations of forest owners reduces the 5 years' harvesting volume by 23.94 m3 per hectare. Results are statistically significant, but with very low R2. This reveals that associations have a negative effect on a very small range of cases in reality. In other words, forest owner associations would have a negative

impact on harvesting volumes when it happens to have any influence on women's forest management.

Table 3. OLS multiple regression for all countries and model (1), α=0.05

Variable	Coef.	Std. Err.	T	P>t
Prob > F				0.76
R-squared				0.09
Root MSE				87.85
Variable	Coef.	Std. Err.	T	P>t
My husband/partner	6.59	9.66	0.68	0.5
Male family members	-1.3	15.81	-0.08	0.94
Family and friends	-9.09	17.12	-0.53	0.6
Forester of state forest administration	-16.11	12.84	-1.25	0.21
Private forester or forest professional	2.52	14.9	0.17	0.87
Forest owner association	-30.94	15.47	-2	0.05
Information and know-how	-20.26	18.22	-1.11	0.27
Machinery	8.19	17.39	0.47	0.64
People to help with manual work	-11.07	12.66	-0.87	0.38
Government funding	11.73	14.68	0.8	0.43
Forest contractors	3.81	14.84	0.26	0.8
Networks	43.69	41.26	1.06	0.29
Internet social media	-24.59	33.08	-0.74	0.46
Female role models	38.16	31.5	1.21	0.23
Experts	-5.27	11.67	-0.45	0.65
_cons	48.64	19.59	2.48	0.01

Source: Own calculations, Based on FEM4FOREST survey data.

Table 4. Results for OLS simple regression for all countries, α=0.05

Variable	Coef.	Std. Err.	t	P>t
Prob > F				0.01
R-squared				0.01
Root MSE				87.31
Variable	Coef.	Std. Err.	t	P>t
Forest owner association	-23.94	11.16	-2.15	0.03
_cons	46.19	9.86	4.68	0.00

Source: Own calculations, Based on FEM4FOREST survey data.

4.3. Results from logistic regressions

For the purpose of the logistic model, all the cases have been included in the equation. The decision-making or the women's understanding of the purpose of their forests are not directly correlated to positive harvesting during the last 5 years. The forests might were at an early age when the survey was conducted. Results are summarised in Table 5.

Table 5. Results for multinomial logistic regression, α=0.05

	Harvesting		Nature conservation		Recreation		Other		Hunting	
Number of obs										171
LR chi2(75)										107.35
Prob > chi2										0.0085
Pseudo R2										0.2376
	RRR	P>z	RRR	P>z	RRR	P>z	RRR	P>z	RRR	P>z
My husband/partner	0.89	0.81	0.76	0.64	17.55	0.10	0.26	0.27	3.38	0.35
Male family members	1.37	0.53	0.91	0.90	0.79	0.90	3.20	0.32	0.00	1.00
Family and friends	0.79	0.67	0.79	0.75	0.49	0.71	6.46	0.10	2.23	0.63
Forester of state forest administration	1.29	0.56	2.86	0.06	2.45	0.45	1.01	0.99	0.00	0.99
Private forester or forest professional	2.33	0.13	3.36	0.09	1.78	0.72	4.00	0.35	0.00	1.00
Forest owner association	0.68	0.49	0.15	0.10	0.60	0.80	0.82	0.87	0.67	1.00
Information and know-how	3.56	0.00	1.84	0.28	3.15	0.37	0.36	0.39	0.20	0.41
Machinery	0.66	0.36	0.53	0.31	1.83	0.63	0.32	0.44	1.12	0.94
People to help with manual work	1.08	0.84	0.84	0.76	0.63	0.71	0.09	0.10	3.44	0.36
Government funding	0.46	0.07	0.31	0.06	0.86	0.90	1.69	0.60	0.25	0.35
Forest contractors	3.96	0.00	2.24	0.18	6.21	0.15	0.64	0.73	0.00	1.00
Networks	0.33	0.06	1.85	0.41	0.00	1.00	2.34	0.48	0.00	1.00
Internet social media	0.29	0.28	0.00	1.00	0.00	1.00	0.00	0.99	285.09	1.00
Female role models	1.36	0.73	1.61	0.72	17.04	0.15	21.80	0.02	0.00	1.00
Experts	1.49	0.44	0.50	0.39	21.75	0.01	14.94	0.54	9.45	0.32
cons	0.32	0.03	0.28	0.06	0.00	0.00	17.95	0.56	0.05	0.07

Source: Own calculations, Based on FEM4FOREST survey data.

The presentation of results is in Relative Risk Ratios (RRR). Everything is compared to "Timber and/or Fuel wood for own use", which has been defined as the base category by Stata. Statistically significant variables are:

- Information and know-how R=3.56, p=0.00, which means that if the information has one unit increase, it is 3.56 times more likely for women to use the forest for harvesting than using timber for their own use if all other factors remain constant.

- Forest contractors – RRR=3.96, p-00, which means that if forest contractors have one unit increase, it is 3.96 times more likely for women to use the forest for harvesting than using timber for their own use, if all other factors remain constant.

- Female role models – RRR=28.80, p=0.02, which means that if women increase the influence of female role models in their management with one unit, it is 28.80 times more likely for women to practice other types of forest utilisation than using timber for their own use if all other factors remain constant.

- Experts – RRR=21.75, p=0.01, which means that if women increase the influence of experts in their management by one unit, it is 21.75 times more likely for women to use

forests for recreation than using timber for their own use if all other factors remain constant.

The abovementioned results are narrowly statistical in interpretation. In real life, results present that women are willing to harvest timber from their forests according to the availability of information and contractors. If they plan to harvest by themselves, they will search for certain information. It is a very interesting result, which reveals the nature of women-forest owners to take information-based decisions. Women do not like to harvest like amateurs, so they enter into contracts with people, or enterprises, who are professionals. Female role models do not inspire women to harvest timber. Possibly, they see at these roles more like environmentally of research-focused examples. Experts are a factor for the utilisation of forests as a recreation centre. Women place such purpose if they keep experts in touch. In other words, if a woman likes to use her forests for recreation, she will find an appropriate expert. Generally, results reveal, that the significant explanatory variables in the model (3) are factors to be chosen for one or another purpose for forest management and vice versa – if women choose one or another purpose, they will use these factors in the management.

5. Conclusions

The present study confirmed that female forest owners need support for increasing productivity, as limitations of the recent practice and lack of such in some of the countries of the Danube region are taking place. It identifies some factors influencing decision-making in the forest management of women private forest owners, affecting productivity and utilisation associated with the protection of forests. It is confirmed this is not accidental and women support their decisions with appropriate resources, provided by different forest associations. For example, discussing the negative influence of the increased volumes being harvested.

Despite the fact that women involve family members and spouses in the business, they do not play any significant role for success in the meaning of better economic indicators. The results from the OLS regression proved that there are no any other significant factors except forest associations.

The results from the logistic regression revealed that most of the factors do not directly influence the harvested volumes, but form attitudes to the forest management. None of the factors of involvement (the first six dummies) plays an important role in forest management decisions. Respondents that answered to these questions positively, in fact, did not gain any benefit from this involvement. It is interesting that government support neither influences the decisions for the purpose of forest utilisation nor the productivity of harvesting. The same is with manual work. This type of work has been involved for various purpose of forests, but have not contributed to any effect. The women forest owners use the information and forest contractors to improve harvesting. This is a result from the logistic regression, which means that women from attitudes toward better harvesting as a result of available information and consultancies with contractors. This means that the information sources and availability of contractors will boost the harvesting in forests owned by women. The results also suggest that women are likely to trust contractors for harvesting. The logistic regression results also

revealed that women tend to use their forests for other purposes along with harvesting. They are inspired by female role models to look for something else for their forests. It is very interesting result that the experts play an important role in the women's attitudes toward using the forests for recreation. This can be used by the forest authorities to improve the diversification of forest utilisation.

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DO REGIONAL MACROECONOMIC VARIABLES INFLUENCE THE INCOME INEQUALITY IN INDONESIA?[5]

This article examines the effects of government expenditures, regional GDP, regional minimum wages, employment rate, and poverty severity on income inequality by applying the system Generalized Method of Moments panel model to overcome the dynamic endogeneity problem from 2007 to 2020. The results show that government expenditure and an increase in the regional minimum wage for low-wage workers can reduce income inequality in both the short run and long run. Furthermore, high regional GDP and high levels of employment rate for workers with low skills can exacerbate the level of income inequality in the long run. However, reducing the severity of poverty has no effect on reducing inequality. This study provides policy recommendations to the government to improve basic public services and make various training skill programs, including ICT, in order to increase creativity and job opportunities for low-income people.

Keywords: income inequality; government expenditures; regional GDP; regional minimum wages; employment rate; poverty severity index

JEL: E01; E24; I30; H50; O15

1. Introduction

Economic inequality is one of the main issues that a country focuses on when determining its domestic policies, both in developed and developing countries (Statistics Indonesia, 2020). Income inequality in mostly nations around the world has experienced a significant increase over the last few years (Afandi, Rantung, Marashdeh, 2017; International Monetary

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Fund, 2021). Income inequality leads to differences in the uneven equality of income and resources in society. In short, it means there is a gap between rich and poor people in a country (Shin, 2012). It is usually measured by the Gini coefficient based on the Lorenz curve and also the changes in the income sharing of the population (the decile ratio) by checking access to basic services and opportunities (Dabla-Norris et al., 2015; Mdingi, Ho, 2021).

Figure 1. Indonesia's Gini coefficient index (2007-2020)
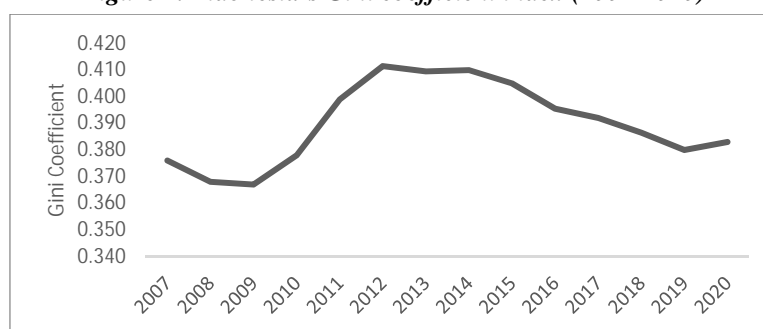
Source: Statistics Indonesia (2021).

Indonesia, as a developing country, has experienced a fluctuating increase in income inequality as measured by the Gini coefficient index over the last few years (Figure 1). Income distribution between regions in Indonesia shows a pattern that varies between provinces, but in Indonesia, the Gini index has decreased from 2007 (0.376) to 2009 (0.367), where the average from that year shows the lowest inequality is in the Bangka Belitung Islands (0.280). From 2010 to 2012, the distribution of Indonesia's income was increasingly uneven, where the Gini coefficient increased sharply but continued to decline from 2014 to 2019 (0.380). Indonesia's highest Gini ratio during the analysis year was in 2012 at 0.412, and the widest income inequality was in the Papua Province at 0.443 and the DI Yogyakarta Province (0.442). In 2020 (0.383), the Gini coefficient again experienced a slight increase from the previous year caused by the Covid-19 pandemic impact, and the area with the highest Gini coefficient was still in the DI Yogyakarta Province (0.436), then Gorontalo (0.407). In the period of 2012 to 2015, the level of inequality in Indonesia showed the highest level. This means that the bigger the Gini coefficient, the more unequal the level of the income distribution (Gnangoin et al., 2019).

To reduce the extreme gap between high and low-income residents, the government utilizes fiscal policy instruments through the imposition of taxes, so that there is a relationship between fiscal policy, poverty, and income disparity, where the government provides transfer payments or public goods for low-income people (Madzinova, 2017; Wernerová, 2019; Malla, Pathranarakul, 2022). Fiscal policies that focus on increasing government spending can encourage Indonesia to break the cycle of intergenerational inequality (The World Bank and Australian Aid, 2015). The interaction of government spending in the public sector can also be measured through income distribution as measured by the Gini ratio (Pula, Xhelili, 2022).

Indonesian government expenditures from 2007 to 2019 continued to increase, but in 2020 government expenditures decreased because the government focused more on health spending, economic recovery, and social safety nets. In 2020, the use of the central government's budget structure was prioritized for taking care of the pandemic and its effects (The Ministry of Finance, 2020).

Several studies have been analyzed, including the determinants of inequality in terms of fiscal spending; for example, research conducted by Mello and Tiongson (2006) suggests that government redistributive spending is inefficient in reducing income inequality and poverty because the benefits of public spending are obtained by the non-poor due to government spending that is not on target (Ramos, 2000). Government expenditure through village funds in Indonesia can reduce some income inequality, although the effect is not very significant because village fund policies are not structured for pro-equality (Ernawati, Tajuddin, Nur, 2021). However, research conducted by Martínez-Vázquez, Vulovic and Moreno-Dodson (2012) in 150 countries (developed, developing, and transitional) between the period 1970-2006 using the GMM panel model stated that government redistribution spending, especially spending in the social sector (social protection, education, health, and housing) has an influence on reducing income disparity.

A high increase in income inequality will also affect economic growth; when the total income of the richest people increases by five percentage points from 20 percent, it will reduce economic growth by 0.4 points. Conversely, if the income of the poorest people increases by five percentage points, economic growth will increase by 1.9 points (The World Bank and Australian Aid, 2015). One of the important parameters in understanding the state of a country in a certain period is to look at the value of Gross Domestic Product (GDP), both based on constant prices and current prices. Constant price GDP is used to specify economic growth from year to year (Statistics Indonesia, 2022; Kholifia et al., 2021). The variable used in this study is a gross regional domestic product at constant prices measured in rupiah to see its effect on income inequality, while other studies use real GDP growth rate per capita (Bagchi, Svejnar, 2015; Agusalim, Pohan, 2018; Royuela, Veneri, Ramos, 2018; Breunig, Majeed, 2019), GDP per capita measured at constant prices in US dollars by Batuo, Kararach and Malki (2022), and GDP per capita as measured in percentage (Carrera, Rombaldoni, Pozzi, 2021).

Gross Regional Domestic Product (GRDP) of Industrial Origin at constant prices continued to increase from 2007 to 2019, but then decreased in 2020 due to the Coronavirus pandemic. In terms of the total GDP of Indonesia in 2020, there was not a significant decrease when compared to neighbouring countries. According to World Bank data, Indonesia's total GDP of 1.058 trillion USD is still above Singapore (340 billion USD) and Malaysia (336.7 billion USD) (The World Bank, 2022).

Another effective instrument in reducing income inequality is the minimum wage policy to increase the income of low-wage workers (Sotomayor, 2021; Pantea, 2020; Lin, Yun, 2016; Maia, Sakamoto, Wang, 2019). Nevertheless, it is worrying that an addition to the minimum wage can diminish employment, especially in developing countries that rely on low labour costs for the purpose of competitiveness (Pantea, 2020). In Indonesia, for example, the minimum wage, which almost doubled from 2012 to 2020, led to a decrease in income

disparity. The minimum wage is the minimum amount of remuneration or the lowest monthly wage that must be paid by employers to wage recipients/employees/labourers in work carried out for a certain period of time and cannot be reduced by mutual agreement or individual contracts, including basic wages and fixed allowances. Meanwhile, the Regional Minimum Wage (RMW) is the minimum wage applicable in a specific province (International Labour Organization, 2014; Regulation of the Minister of Labour Republic Indonesia No. PER-01/MEN/1999; Statistics Indonesia, 2022). The average RWM Indonesia over the last 14 years continues to increase.

The role of minimum wage as a labour policy affects the supply in the labour market in Indonesia so that job opportunities will decrease. The employment rate is the percentage of the labour force over the age of 15 who are employed (Statistics Indonesia, 2022). Nowadays, the growth in income disparities is recognized as one of the foremost developments in employment relations and has been considered as an important tool for reducing inequality (Kochan and Riordan, 2016). Research conducted by Maia, Sakamoto and Wang (2019) in Brazil found that income inequality in Brazil is significantly higher than in developed countries such as the US, where Brazil faces lower economic development due to low education, wages, and work skills in its labour force. This challenge is also faced by Indonesia, where the poor and vulnerable groups are those who are employed in low-skilled jobs (Lindsay et al., 2015) and thus widen income disparities. The men of productive age who possess low skills are less likely to be employed than people who have high skills (Wolcott, 2020). Social support for an increment in the minimum wage is also an important policy in reducing poverty levels (Sotomayor, 2021).

Moreover, inequality is one of the issues often associated with poverty. There is a positive dynamic causality relationship between poverty and income disparity in both the long-term and short-term (Apergis, Dincer and Payne, 2011). Sen (1976) and Foster et al. (1984) state that disparity and poverty have a close relationship in which inequality is an element of poverty (Annim, Mariwah and Sebu, 2012). Inequality and poverty have a pragmatic relationship where inequality can exacerbate poverty levels because the disparity is a form of poverty (Barber, 2008). The increase in income inequality of the poor increases the poverty gap, thereby increasing income inequality (Hassan, Zaman, Gul, 2015). A good benchmark in calculating the poverty level includes three poverty parameters, that is: (a) the poor as measured by percentage, (b) the overall poverty gap, and (c) the distribution of income among the poor as seen from the poverty severity index (Kakwani, 2000).

The percentage of poor people below the poverty line is calculated roughly (Statistics Indonesia, 2021; Badrudin, 2017). This measure has the same weight, so that there is no difference between the very poor and the very rich among the poor. The effect is that the number and percentage of poor people has not been able to show how severe poverty is. Poverty severity assesses how poor the poor people actually are compared to other poor people. Thus, the poverty severity index is more sensitive in explaining the size of inequality among the poor; what this means is that the greater the value of the poverty severity index is, then the higher the distribution of income or expenditure among the poor (Panda, Rath, 2004 in Ofori-Boateng, 2016; Ravallion, Bidani, 1993). The Poverty Severity Index (P2) indicates the distribution of per capita expenditure among the poor that is not evenly distributed among the poor (Statistics Indonesia, 2021; Debebe, Zekarias, 2020). According to Statistics

Indonesia, the severity of poverty in Indonesia from 2007 (0.84) to 2014 (0.44) decreased every year, but in 2015 it increased (0.52) due to the poverty line in rural areas, which was IDR250,739; this was higher than urban areas, which was IDR243,059. Villagers usually buy goods that are distributed from the city at retail so that the price obtained by the village community becomes more expensive. The poverty severity index fell again in 2019 by 0.37 and increased again in 2020 by 0.43 due to the Covid-19 Pandemic. Although the severity of poverty in Indonesia fluctuates, the number is still relatively high, which is still above 0.3 points.

This article expands the previous research by connecting regional macroeconomic variables together. Therefore, this study aims to examine the influence of government expenditures, regional GDP, regional minimum wages, employment rate, and poverty severity on income inequality in Indonesia.

2. Data Description and Methodology

2.1 Data and description of variables

2.1.1 Data

Data was obtained from The Ministry of Finance and Statistics Indonesia. This study utilized secondary data in the form of time series from 2007 to 2020 and cross-section data which consisted of 33 provinces in Indonesia. The province of North Kalimantan was not included in the analysis because it only existed in 2012. This research can be categorized into polled data, a combination of time series, and cross-section data.

Table 1. Variable description

Variable	Definition/Measurement	Source
Gini Coefficient (GINI)	A measure of income inequality, the value ranges between 0 (perfect income distribution) and 1 (perfect inequality) (points)	Statistics Indonesia
Government Expenditure (GOVEXP)	Total expenditure at fiscal year (IDR)	The Ministry of Finance
Gross Regional Domestic Product (GRDP)	Gross regional domestic product at constant prices (IDR)	Statistics Indonesia
Regional Minimum Wage (RMW)	Minimum wage applicable to each province (IDR)	Statistics Indonesia
Employment Rate (ER)	The percentage of the labour force that works (%)	Statistics Indonesia
Poverty Severity Index (PSI)	A measure of the severity of poverty, the higher the index value, the more unequal the expenditure among the poor (points)	Statistics Indonesia

Source: Author's Compilations.

According to the previous literature, this analysis used six variables. Table 1 shows a list of variables used in this analysis. The dependent variable is the Gini coefficient, and the explanatory variables are government expenditures, regional gross domestic product, regional minimum wages, employment rate, and poverty severity index.

2.1.2 Descriptive Statistics Analysis

Descriptive statistical analysis is a form of data analysis that shows a number of observations that are very important for carrying out research. This type of analysis is based on the data that has been collected (Rashid, Bakar, Razak, 2016). The following analysis describes all variables used in this study.

Table 2. Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
GINI	462	0.35906	0.03773	0.25950	0.44250
LogGOVEXP	462	12.56409	0.43650	11.54259	13.81250
LogGRDP	462	13.97321	0.59548	12.35675	15.26393
LogRMW	462	6.12797	0.21184	5.65176	6.63107
ER	462	94.01158	2.48417	84.24563	98.60196
PSI	462	0.66365	0.68260	0.07000	5.66000

Note: T=14, N=33
Source: Calculation by the authors.

Table 2 shows that all variables have an observation range of 462. ER, or the level of employment rate, has the highest average value at 94.012 percent, with a standard deviation of 2.484 percent, a maximum value of 98.602 percent, and a minimum value of 84.246 percent. The large labour force causes a high level of employment rate. Furthermore, Income Inequality (GINI) obtained the lowest standard deviation of 0.0377 with a mean value of 0.3591, a maximum value of 0.4425, and a minimum value of 0.2595. Indonesian government expenditures (LogGOVEXP) average is 12.5641, with a standard deviation of 0.4365. The minimum score is 11.5426, while the maximum score is 13,8125. A standard deviation more minor than the mean value indicates a small gap between the most minor and enormous government expenditures. Based on the six variables studied, GINI, LogGOVEXP, LogGRDP, LogRMW, and ER show a standard deviation that is smaller than the mean value, which means that the distribution of the data variables is the smallest or there is not a large big enough gap between the lowest and the highest. The PSI shows an average of 0.6637, a maximum value of 5.6600, and a minimum value of 0.0700. This indicates that there is still a high disparity in spending among the poor, such as in the Provinces of West Papua and Papua, from 2007 to 2020.

2.2 Model

The effect of government spending, regional gross domestic product, regional minimum wage, level of employment, and the severity of poverty on income inequality can be analyzed using panel data which aims to minimize the bias that comes from the effect of testing the results of the regression. Furthermore, the panel data model estimation is carried out through two approaches, namely the Pooled Least Squared and the Fixed Effect Model.

Arellano and Bond (1991) recommend the panel Generalized Method of Moments (GMM) model, whose measurement is through dynamic effects, where the approach used is more efficient than the Anderson and Hsio (1982) estimator (Baltagi, 2005).

The dynamic panel method is used to show the correlation between parameters in a dynamic economy. This dynamic correlation is seen from its characteristics; namely, there is a lag of the dependent or dependent variable that is between the regressors or independent variables. Therefore, the dynamic data method is the right model to be used in analyzing the economy (Baltagi, 2005).

The dynamic panel data model can be written as (Ekananda, 2016; Baltagi, 2005)

$$y_{it} = \gamma y_{it-1} + \beta' x_{it} + u_{it}; i=1,2,3,.....,N; t = 1,2,3,......,T \tag{1}$$

where:

y_{it} is the unit of observation of the ith cross-section at time period t,

γ is a scalar or intercept coefficient,

x is a matrix of size 1 x K,

β is a matrix of size K x 1, and it is assumed that u_{it} is a one-way error component model, the equation is (Baltagi, 2005; Nabilah, Setiawan, 2016; Mileva, 2007):

$$u_{it} = v_{it} + e_{it} \tag{2}$$

where:

v_{it} is the effect of the unobserved region specification

e_{it} is the error term.

Ekananda (2016) said that the basis of a regression model assumption is that the dependent variable has a relationship with the residue even though the regressor is not allowed to have a correlation with the residue. Equation 1 shows that there are lagged dependent variables that have a relationship with the residue. Therefore, testing with OLS is inconsistent and to replace the lag of the dependent variable, the instrument variable is used. The GMM model overcomes the problem of the relationship between lagged dependent variables and residuals by using a variable instrument.

Testing using the GMM dynamic panel model in this study considers several basic aspects, that is: 1) The GMM Panel Model is able to handle endogeneity associated with the use of lag in the dependent variable. 2) The GMM panel approach is designed for data that has small or short T-time series data but large or N-many cross-sections. 3) The emergence of the dependent variable lag (dependent) variable y_{it-1} will cause autocorrelation. Therefore, the GMM dynamic panel includes the instrument variable with the dependent variable in the previous year. 4) Characteristics of an area that is time-invariant, such as in terms of geography and similar demographics (fixed effects), may be correlated with explanatory variables so that the fixed effects contained in the error term equation can be seen from equations 1 and 2 above. This problem can be overcome by transforming the regressor into the first difference (Mileva, 2007).

The influence of government expenditures, gross regional domestic product, regional minimum wage, employment rate, and poverty severity on income inequality in Indonesia is formulated through the model developed by Arellano dan Bond (1991) and Blundell dan

Bond (1998) specification of the dynamic panel equation model Generalized Method of Moment (GMM) is as follows (Ekananda, 2016; Iskandar, 2021; Jia, Guo and Zhang, 2014; Ullah, Akhtar and Zaefarian, 2018; Pantea, 2020):

$$GINI_{it} = \alpha + \beta_1 LogGOVEXP_{it} + \beta_2 LogGRDP_{it} + \beta_3 LogRMW_{it} + \beta_4 ER_{it} + \beta_5 PSI_{it} + \beta_6 GINI_{it-1} + \varepsilon_{it} \qquad (3)$$

GINI is income inequality as measured by the Gini coefficient Index, LogGOVEXP is total government spending, LogGRDP is Gross Regional Domestic Product, LogRMW represents the regional minimum wage, ER is the level of employment rate, and PSI is the Poverty Severity Index. β_j (where *j=1,2,...6*) is the parameter to be estimated, *i* is the cross-section (*i=1,2,3,....., N*); *t* is time t is time series (*t = 1,2,3,......, T*); ε_{it} is error term; $GINI_{it-1}$ represents one lag (lag to t) of the dependent variable income inequality in the previous year's performance (*t-1*), which is this lag included as an explanatory variable in the GMM estimation used.

The instrument variable in equation 3 is the lag contained in the endogenous variable in the form of income inequality and the exogenous variable in the model as independent variables (Iskandar, 2021).

The development of a model in which the use of the lag of the dependent variable in the regression as a regressor results in the emergence of endogeneity problems if it is estimated using a fixed-effects or random-effects approach, which results in bias estimation and does not occur consistently (Verbeek, 2004).

Two estimation processes are commonly used in the context of GMM to overcome existing problems, that is (Firdaus, 2020):

1. The approach from Arellano-Bond (1991) is called First-Difference GMM (FD-GMM).

$|\alpha|$ $y_{it} = \alpha y_{it,t-1} + \eta_i + v_i$ for example, if an autoregressive equation appears and one time difference or AR (1) is accompanied by unobserved individual-specific effects, it is <1.

$E[v_{it}] = 0, E[\eta_i] = 0, E[v_{it}\eta_i] = 0$ where *i* =1,..., N; *t* =2,...,T and $\eta_i + v_{it=} u_{it}$ it has the following standard error component composition:

where *i* = 1,..., N and *t* = 2,…,T

we can assume unrelated/correlated transient errors over time.

$E[v_{it}v_{is}] = 0$ where *i* =1,..., N and $s \neq t$

And the initial condition y_{i1} is predetermined

$E[y_{i1}v_t] = 0$ where *i* =1,..., N and *t* = 2,…,T

This assumption simultaneously implies the emergence of munculnya *m* = 0.5 (T-1) x (T-2) moment restrictions

$E[y_{i,t-s} \Delta v_t] = 0$ where *t* =3,…,T and $s \geq 2$

$E[Z_i \Delta v_i] = 0$ so it can be written as

Where Z_i is (T-2) x *m* matrix i.e.:

$$
\begin{bmatrix}
y_{i1} & 0 & 0 & \dots & 0 & \dots & 0 \\
0 & y_{i1} & y_{i2} & \dots & 0 & \dots & 0 \\
. & . & . & \dots & . & . & . \\
0 & 0 & 0 & \dots & y_{i1} & \dots & y_{i,T-2}
\end{bmatrix}
$$

And Δv_i is (T-2) vector $(\Delta v_{i3}, \Delta v_{i4}, \dots, \Delta v_{iT})$. This is the GMM condition, which is the dependent variable lag since *t*-2, and is called FD-GMM. This approach will create an estimator that has a consistency of if $N \rightarrow \infty$ at a relatively low or small *T*.

Limitations in the FD-GMM estimator will appear, causing the instrument to form a correlation/relationship between the lagged through the first differences, resulting in a weak instrument used (Blundell and Bond, 1998). The FD-GMM estimator will be more downward biased than the fixed effect, especially if the sum of the periods is limited. Therefore, the FD-GMM can be repaired if there is a use of the present value of lag that comes from the regressor as the instrument.

The weakness of the FD-GMM can be found by comparing the coefficients of the lagged variables obtained from the pooled least square, fixed effect, and FD-GMM model approaches. The model from panel data uses AR(1); if it is estimated through the pooled least square method, it creates an upward bias coefficient. However, if it is estimated through the within-group or fixed effect technique, it will create a downward bias coefficient. Therefore, the consistency of the coefficients can be accepted if the value is between the two.

2. The latest approach from Blundell and Bond (1998) is called System GMM (Sys-GMM)

The initial idea of system GMM is to estimate a system of equations derived from the first differences and at the level, using the instrument from the first differences. Blundell and Bond (1998) add several assumptions in estimating system GMM as follows:

$E(\eta_i \Delta y_{i2}) = 0$ for *I* =1,…, *N*

The above equation will occur if the mean of y_{it} is constant in periods 1,2,…, *T* for every *i*. The calculation of the instrument matrix in the System GMM estimator is:

$$
Z_i^* = \begin{bmatrix}
Z_i & 0 & 0 & \dots & 0 \\
0 & \Delta y_{i2} & 0 & \dots & 0 \\
0 & 0 & \Delta y_{i3} & \dots & 0 \\
. & . & . & \dots & . \\
0 & 0 & 0 & \dots & \Delta y_{i,T-1}
\end{bmatrix}
$$

The moment conditions of the second degree of bias are described as follows:

$$E(Z_i^* u_i^*) = 0$$

Which is $u_i^* = (\Delta v_{i3}, \dots, \Delta v_{iT}, u_{i3}, \dots, u_{iT})$

That way, the system GMM estimator can combine the first differences equation group at the value level as the instrument with a different group at the first differences equation level as the instrument. The validity of adding these instruments can be seen in the Sargan test for over-identifying instruments.

The benchmarks for obtaining the best GMM or dynamic model are as follows (Firdaus,

2020; Ullah, Akhtar, Zaefarian, 2018).

1. **Consistent;** The consistent characteristic of the estimator will be able to be tested through the Arellano-Bond m_1 and m_2 statistical tests, and some software can automatically calculate it. The consistency of the estimator is obtained if the m_1 statistical test results in rejecting the null hypothesis and the results from the m_2 statistic state that the null hypothesis is accepted or the null hypothesis cannot be rejected.

2. **Valid Instruments;** Validity check using the Sargan test. The instrument is said to be valid if the Sargan test shows that it cannot reject the null hypothesis (accept the null hypothesis). If the null hypothesis is rejected, the researcher must reconsider the model or instrument used in the study.

3. **Unbiased;** The pooled least squares estimator has a biased upwards character, and the fixed effect has a biased downward character. The estimator is said to be unbiased between the two estimators.

3. Estimation Results and Discussion

3.1 Estimation techniques

This study uses static and dynamic models to achieve research objectives systematically. The GMM Panel estimation approach uses short panel data from 33 provinces (N) for 14 years (T) because of N > T. The function of the GMM method is as resilience between one another in observing the consistency of the relationship between observed parameters (Adeleye et al., 2020).

The static model is in the form of Pooled Ordinary Least Squares (POLS), where this model does not allow heterogeneity in all panel data, while the Fixed Effect (FE) model in the System Generalized Method of Moments (Sys-GMM) panel data can recognize heterogeneity. The Sys- GMM estimator was made to analyze panel data in the short run with the assumption that the process is dynamic, i.e., the current realization of the dependent variable is influenced by the previous realization apart from the fact that the regression is also not entirely exogenous and may be correlated with past realizations and may also the current time of the error term (Adeleye et al., 2020).

The procedure to show how the Sys-GMM Panel estimate is stronger than Pooled Least Square (PLS) is to estimate using panel data with Ordinary Least Square (OLS) and fixed effects. It can be started by analyzing OLS first and identifying the endogeneity problems that occur, followed by using fixed effects. The next step will be to show that the fixed effect cannot overcome the dynamic endogeneity problem. The GMM Panel model then includes the lagged value of the dependent variable (i.e., the variable from the previous year). Therefore, the problem of endogeneity can be resolved through a valid estimate from a very strict GMM process (Ullah, Akhtar, Zaefarian, 2018).

3.2 Estimations and Discussion

This study uses static and dynamic models to achieve research objectives systematically. Estimation of the analysis carried out started using the POLS method and then continued using the FE, FD-GMM, and Sys-GMM methods (Table 3).

Table 3. Static and dynamic model results

Variable	Static Models		Dynamic Models			
	POLS (1)	FE (2)	POLS (3)	FE (4)	*FD-GMM (5)*	*Sys-GMM (6)*
LogGOVEXP	-0.002496 (0.8056)	0.021529 (0.0364) **	-0.020429 (0.0003) ***	0.004912 (0.6267)	0.0147924 (0.445)	-0.0298024 (0.043)**
LogGRDP	0.027430 (0.0001) ***	0.055198 (0.0000) ***	0.020356 (0.0000) ***	0.051794 (0.0000) ***	0.0552912 (0.000)***	0.0520562 (0.000)***
LogRMW	-0.014118 (0.1609)	-0.087160 (0.0000) ***	-0.010913 (0.0444) **	-0.071622 (0.0000) ***	-0.0864336 (0.000)***	-0.0403222 (0.004)***
ER	0.002124 (0.0023) ***	0.001974 (0.0343) **	0.000378 (0.3339)	0.001217 (0.1170)	0.0013176 (0.310)	0.0020557 (0.090)***
PSI	0.017683 (0.0000) ***	-0.002033 (0.6174)	0.006703 (0.0001) ***	0.000853 (0.8286)	-2.42e-06 (1.000)	0.001883 (0.681)
GINI(-1)			0.857504 (0.0000) ***	0.523438 (0.0000) ***	0.4663482 (0.000)***	0.5718994 (0.000)***
C	-0.117745 (0.1495)	-0.332898 (0.0000) ***	0.050929 (0.2917)	-0.290813 (0.0003) ***	-0.3615562 (0.001)***	-0.146515 (0.059)*
R-squared	0.164947	0.760661	0.784418	0.857235		
Adjusted R-squared	0.155791	0.739775	0.781353	0.843324		
Durbin-Watson stat	0.277606	0.950982	2.070542	2.074204		
AR (1) AR (2)					0.0001 0.1505	0.0000 0.2065
Sargan test statistics					0.6977	0.2917
Observation	462	462	429	429	396	429
Instruments					84	96

*, **, *** Significant at the 10, 5 and 1 percent levels, respectively
Source: Authors' Computations.

3.2.1 Result of Pooled Ordinary Least Square and Fixed Effect

The approach with Pooled OLS Model does not pay attention to individual effects in cross-section and time-series data. Another approach assumption of the OLS model is that it is homogeneous between one group and another (Ullah, Akhtar and Zaefarian, 2018). The FE model has a different approach between the observed cross-sections so that heterogeneity appears between each group. The OLS and FE Panel models raise the issue of endogeneity (Verbeek, 2004).

The first estimate of the static POLS model shows that the GOVEXP and RMW coefficients are negative and insignificant to the GINI. Statistically, only the poverty severity coefficient shows a theoretically positive effect and is statistically significant in the sample, which indicates the percentage change in PSI increases the GINI by 0.0177. In summary, policies are needed to reduce the number of poor people.

The second estimate in the static FE model reveals a significant change in the PSI coefficient, which has a negative but significant effect. The RMW coefficient is the only variable by the theory, which shows a negative and significant effect on the GINI, which is 0.0872, where every percentage change in the regional minimum wage will cause a decrease in income inequality by 0.0872. This result implies that the implementation of regional minimum wages has an impact on low-income workers and is able to restore the distribution of wages to a very low level, thereby reducing the wage gap. The results of this study follow previous research (Sotomayor, 2021; Pantea, 2020; Lin, Yun, 2016).

The third and fourth estimates use a dynamic approach in the POLS and FE models, including the dependent lag component in the independent variable. The research analysis, although statistically significant, gave different results in the dynamic POLS and FE models, namely the POLS GINI coefficient (-1), which was 0.8575, which was greater than the FE GINI(-1), which was 0.5234. This difference becomes a serious problem in interpreting the results where the POLS results give biased results compared to FE.

3.2.2 Results of First-Difference GMM and System GMM

The test used in this analysis is the Panel Generalized Method of Moments (GMM). Table 3 shows the estimation results of FD-GMM and Sys-GMM dynamic panels.

Based on the previous explanation, the panel data model on income inequality is a dynamic model in which the lagged value is found in the dependent variable from the right side of equation 3. This theoretically can lead to a biased situation if it does not use the right analytical method (Anwar, 2018). The GMM model can overcome the problems caused by the dynamic state of the income inequality model. Table 3 shows several model specifications in order to obtain the best model and so that it describes the best results in the model.

The GMM model generally uses two types of estimates: The first difference is between GMM and system GMM. Before interpreting the estimated results of the GMM method, the first thing that needs to be done is to check the feasibility of the model. This test is carried out to obtain the best model criteria, for instance whether it is consistent, a valid instrument, and unbiased. The first estimate in measuring the feasibility of the model is by checking the consistency of the AR (1) and AR (2) values, or the p-value in the first and second-order correlations (Ullah, Akhtar and Zaefarian, 2018).The AR (1) test generally rejects the null hypothesis, but the main parameter is shown by the AR (2) value (Anwar, 2018). Table 3 shows the results of AR (2) on FD-GMM and Sys-GMM, obtaining p-values of 0.1505 and 0.2065, which means that they are not statistically significant at the 10 percent level. These results show that the consistency requirements are met where the coefficient estimation is consistent. The Arellano-Bond test is used to test for the absence of autocorrelation (no serial correlation) if under the null hypothesis where the error terms from two different periods are not correlated (Ullah, Akhtar, Zaefarian, 2018).

The second estimation of the feasibility of the model is testing the validity of the instrument used in the model using the Sargan test. The results of the Sargan test in the FD-GMM show that the p-value is 0.6977, and the Sys-GMM model is 0.2917, which means it is not

statistically significant at the 10 percent level and accepts the null hypothesis, so it can be concluded that the instruments used in both models are valid.

The third test of the dynamic model obtains an unbiased estimate. The estimator is said to meet the unusual condition if the GINI Lag is between the POLS and FE estimators. A fair assumption can be realized because the estimated value of the GINI lag variable coefficient in the Sys-GMM model, which is 0.5719, is between the Pooled Least Squares estimator, which has a biased upwards character of 0.8575, and the Fixed Effect model which has a biased downwards character of 0.5234. On the other hand, the FD-GMM model does not meet the requirements because the value obtained is 0.4663, which is below the two estimators (Firdaus, 2020; Ullah, Akhtar, Zaefarian, 2018), so the dynamic panel model with the Sys-GMM approach is the best statistically because it has met the criteria for consistency, instrument validity and is unbiased.

Table 4. Results of the system GMM panel model in the short run and long run

Variable	Sys-GMM	
	Short-run	*Long-run*
LogGOVEXP	-0.0298024 (0.043)**	-0.0696154 (0.070)*
LogGRDP	0.0520562 (0.000)***	0.1215981 (0.000)***
LogRMW	-0.0403222 (0.004)***	-0.0941887 (0.001)***
ER	0.0020557 (0.090)*	0.004802 (0.090)*
PSI	0.001883 (0.681)	0.0043986 (0.686)
GINI(-1)	0.5718994 (0.000)***	
C	-0.146515 (0.059)*	

*, **, *** Significant at the 10, 5 and 1 percent levels, respectively
Source: Authors' Computations.

The use of the GMM dynamic panel model has its advantages; one of which is knowing an equation's long-run and short-run effects. After the best model is obtained, Table 4 can show the long-run and short-run effects of the Sys-GMM model. Lagged variable income inequality has a positive and significant influence. The foremost suitable government policy in diminishing income disparity is to consider backwards-looking.

Government spending has a negative and significant influence on income disparity. The GOVEXP coefficient shows an effect of 0.0298 at a significance level of 10 percent, thus if there is an increase in government expenditures by 1 percent, it causes a decrease in income disparity by 0.0298. In the long run, an increase in government expenditures can also reduce income inequality by 0.0696. This shows that government expenditures can reduce income inequality in all provinces in Indonesia.

A small effect indicates that an increase in government expenditures in areas with a low Gini coefficient has a negligible impact on income distribution, so government spending is relatively inefficient in reducing income inequality in areas that already have a more even

distribution of income, as has happened in the following provinces, where the average government expenditure from 2007 to 2020 exceeds the national average (IDR 6.38 trillion) and the average income inequality is lower than the national average (0.36) that is, in the North Sumatra Province (IDR 7.59 trillion; 0.32), Riau (IDR 6.43 trillion; 0.35), Lampung (IDR 6.97 trillion; 0.32), and East Kalimantan (IDR 8.85 trillion; 0.35). However, government expenditures will be more efficient in these areas where the average government expenditure is higher nationally, but the average Gini coefficient is also higher than the national level, for example, DKI Jakarta (IDR 37.91 trillion; 0.40), the West Java Province (IDR 20.37 trillion; 0.39) and East Java (IDR 18.54 trillion; 0.37). Thus, the addition of regional government expenditures that have a high Gini coefficient will be more efficient in reducing income inequality (Baer, Galvão, 2008).

Likewise, previous studies have found similar results where stated that government spending, especially on infrastructure, can reduce income inequality (Alamanda, 2020). The analysis conducted by Sánchez and Pérez-Corral (2018) also shows that government expenditure on health and social protection has a negative and significant impact on income inequality in developing countries.

Gross regional domestic product shows a positive and statistically significant impact on income inequality. The coefficient of the gross regional domestic product shows an effect of 0.0521 in the short run, which means that if there is an increase in GRDP by 1 percent, it will cause an increase in income inequality by 0.0521. In the long run, an increase in GRDP can also exacerbate income inequality by 0.1216. This shows that GRDP can increase income inequality in all provinces in Indonesia. This study's results align with studies by Agusalim and Pohan (2018), which state that the GDP variable has a positive impact on income inequality, indicates that macroeconomic growth has not been enjoyed equally by the Indonesian population. Economic growth also exacerbates income disparity in the long run, and this inequality can be reduced by creating inclusive economic growth. Other empirical evidences also show a direct positive impact of per capita income on the Gini coefficient (Rubin, Segal, 2015; Nahum, 2005; Muinelo-Gallo, Roca-Sagalés, 2013). However, other research shows a negative and statistically significant effect between GRDP and income distribution between districts in Central Java, Indonesia (Soeharjoto, 2019).

The regional minimum wage shows a negative and statistically significant influence on income inequality. In the short run, RMW shows an effect of 0.0403, so if there is an increase in the regional minimum wage by 1 percent, it causes a decrease in income inequality by 0.0403 points. In the long run, an increase in RMW can also reduce income inequality by 0.0942. Increasing the regional minimum wage for regions in Indonesia should increase the income of millions of workers who earn low wages so that income inequality decreases. These findings are in line with those proposed by Lin and Yun (2016) and Engelhardt and Purcell (2021). Sotomayor (2021) states that a minimum wage increase in the first three months reduces the income disparity by 2.4 percent in Brazil, and the effect is gets stronger over time.

The increase in income disparity is also associated with a decrease in the minimum wage in Mexico (Bosch, Manacorda, 2010). For example, in the Yogyakarta Province, which received the lowest RMW among 33 other provinces in Indonesia in 2020, was IDR 1,704,608, with the highest inequality of 0.436 points. A study conducted by Howell (2020)

in urban China found that the minimum wage significantly helped reduce aggregate wage inequality, where an average increase of 26 percent reduces the Gini coefficient by 10 to 12 percent. However, the results obtained are different from other studies, which say that the contribution of people's wage income in China continued to decline from 2005 by 81 percent and in 2010 to 69 percent (Lee, 2013).

The level of employment rate shows a positive and significant response to income inequality. The employment rate shows an effect of 0.0021 at a significance level of 10 percent, so if there is an increase in ER of 1 percent, it causes an increase in income inequality of 0.0021. In the long run, the addition of ER can also exacerbate income inequality by 0.0048. This is due to inequality in the labor market, where workers who have good skills get high salaries while other workers are trapped in informal jobs that require low productivity and low salaries. Because of their limitations, the workers do not get opportunities to develop their skills (Wicaksono, Amir, Nugroho, 2017; World Bank, 2016). People with high skills are more likely to be employed than those with low skills, but in the trade sector, mastery of technology can reduce the demand for low-skilled labour (Wolcott, 2020).

Therefore, equal distribution of education is the main key to developing human resources, both in mastering skills, industry, problem-solving, and creativity. The government, in this case, must encourage the public to participate in education in terms of the quality that follows the needs of the labour market, cost, and physical affordability in order to prepare a reliable workforce and stimulate the economy as a whole (Muin, 2020).

The severity of poverty in both the short run and long run shows signs that are in accordance with the theory but are not statistically significant on income inequality. This is because the severity of poverty is only seen from the calculation of a certain formula in which some people are below the poverty line. For example, in 2020, only 10 percent of the total Indonesian population is poor people. The World Bank's criteria divide the expenditure/income of the population into three groups: the lowest 40 percent of the population's expenditure, 40 percent of the middle population's expenditure, and the high 20 percent of the population's expenditure. The inequality only focuses on the percentage received by the 40 percent of the lowest income group of all incomes in a region (Statistics Indonesia, 2021; Heryanah, 2017). Thus the severity of poverty is a measure of income inequality among the poor, while income inequality is seen from the entire population.

Evan, Hout, and Mayer (2004) state that inequality is not only closely related to absolute poverty, where the poor are below the poverty line and are not sufficient to meet their minimum life needs, but the number of retirees, unemployment rates, consumption, and health levels also affect disparity (Annim, Mariwah and Sebu, 2012; Mintchev, Boshnakov and Naydenov, 2010). Therefore, there is great concern in society about income inequality among those who are poor or low-income when it comes to health status (Oshio, Kobayashi, 2009). Debebe, Zekarias (2020) and Ravallion (2005) mention that the higher the poverty rate, the higher the income inequality.

The Indonesian government has so far carried out various inclusive and affirmative development policies in overcoming income inequality, namely: 1) Development of a comprehensive social protection system. 2) Improvement of basic services to the poor. 3) Development of sustainable livelihoods for the poor through entrepreneurship and labor

distribution (Kementerian Perencanaan Pembangunan Nasional/Badan Perencanaan Pembangunan Nasional, 2014). The government seeks to provide housing, provide clean water, and sanitation facilities for the poor in rural areas (Badan Perencanaan Pembangunan Nasional, 2013). Social assistance programs in the form of cash assistance to families of hope (PKH) for the poorest families, provision of subsidized rice to low-income residents (Raskin), scholarships to outstanding students (Bidikmisi), BOS assistance program for the education sector, empowerment of the poor through joint business groups (KUBe) and others. However, there are various problems in government programs where implementation is still very limited, the impact of the program has not been felt by the entire population, such as not yet properly targeting the beneficiaries of social protection assistance because the government is experiencing problems updating poor household data. Based on the 2013 Susenas data, only about 1.5 percent of the poor received social assistance, such as PKH and Raskin, from the poorest 10 percent of the population (Supriyanto, Ramdhani, Rahmadan, 2014).

4. Conclusions

Indonesia is country with one of the largest areas in the world, which consists of many islands, both small and large, but it has not been able to completely break the cycle of income inequality between provinces and overcome the problem of income inequality between regions. Nevertheless, nationally the Gini coefficient has decreased for the last six years before 2020. This article examines the effects of government spending, regional GDP, minimum wages, employment rate, and poverty severity on income inequality using the panel system Generalized Method of Moments (Sys-GMM) model.

The study results indicated that in both the short-run and long-run effects, government spending and the regional minimum wage encourage a reduction in income inequality. Targeted government spending, such as spending on health and social protection for people below the poverty line and increasing regional minimum wages for low-wage workers, can encourage development to reduce income inequality.

However, regional GDP and a high employment rate may not necessarily reduce inequality; even in the long run, it will exacerbate inequality because a high regional GDP can create economic disparities between regions. After all, regional economic growth measured by GRDP at a macro level cannot be enjoyed equally by all. If adequate skills do not accompany the high employment rate, it will also be unable to reduce inequality.

The decrease in the severity of poverty among the poor does not affect the decline in the Gini coefficient because there are other factors, such as health and consumption, which have a more direct influence. The measure of poverty severity only looks at income inequality among the poor. However, inequality only focuses on the percentage received by the 40 percent of the lowest income group of all incomes in a region.

This article recommends the Indonesian government to hold training in mastering information, communication, and technology (ICT) for low-income and poor people because mastering technology can expand creativity and create job opportunities for people who have

low skills. It also suggested to provide credit for micro, small and medium enterprises in agriculture and fisheries is necessary because most of the poverty is at this sector. Government investment in the sector that absorbs a large workforce is also needed as well as conducting various training in skills development and internships. Improving the quality of basic public services at the local level, such as health services, is important because good health increases work productivity and income. Finally, food price stability and targeted subsidies can reduce the burden on the poor, thereby reducing income inequality.

The main limitation of researchers in analyzing the problems that exist in Indonesia is that this study has not explained the causes of income inequality in each province in detail. Indonesia consists of several large islands and a very wide area; even the size of an island in Indonesia can be equivalent to a country. Therefore, the causes of income inequality, economic development, and poverty are different in each region. This study describes an empirical analysis of old issues that are still considered important today.

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SUMMARIES

Igor Kryvovyazyuk, Igor Britchenko, Serhii Smerichevskyi, Liubov Kovalska, Viktoriia Dorosh, Pavlo Kravchuk

DIGITAL TRANSFORMATION AND INNOVATION IN BUSINESS: THE IMPACT OF STRATEGIC ALLIANCES AND THEIR SUCCESS FACTORS

The purpose of the article is to reveal the scientific approach that substantiates the impact of the creation of strategic alliances (SA) on the digital transformation of business and the development of their innovative power based on identified success factors. The aim was achieved using the following methods: abstract logic and typification (for classification of SA's success factors), generalisation (to determine the peculiarities of SA's influence on their innovation development), analytical and ranking method (to determine the relationship between the dynamics creating of SA and the degree of acceleration of digital transformation), expert evaluation (to determine the degree of influence of SA success factors by business areas). Implementing a business-integrated approach to understanding digital transformation will accelerate the implementation of innovation and organisational change, identifies future prospects for market, customer and business relationships, highlighting the importance of researching the factors that ensure their success. An alternative vision of SA's success factors is suggested, which are determined by the possibilities of the organisation of partnerships and organisational culture, integration of business sectors, compatibility of management goals, external relevance, obtaining synergies. Innovation is considered by the authors as an integration factor that reconciles all groups of SA success factors, giving them the necessary focus to solve business problems. The results of the study show that the creation of SA has a significant impact on accelerating and changes the priority of digital transformation of business areas involved in strategic partnerships, and the impact of SA on the development of their innovation power is crucial.
Keywords: digital transformation; innovation; strategic alliances; success factors of SA; business development
JEL: C83; D74; F23; L2; M16; O3

Anton Gerunov

STOCK RETURNS UNDER DIFFERENT MARKET REGIMES: AN APPLICATION OF MARKOV SWITCHING MODELS TO 24 EUROPEAN INDICES

This paper studies the different modes of operation of European stock markets. Using data on 24 European indices over a period of 15 years, we show that these can be well represented by a Hidden Markov Model with two regimes that roughly correspond to bull and bear markets. We further estimate regime parameters and show that the alternate regimes have very different risk-return tradeoffs with clear implications for portfolio management. Corresponding transition probability matrices show the remarkable persistence of states and give a possible quantitative estimate of the degree of inertia in financial markets. Regime-switching coordination across markets is further examined, showing that moments of correlations are followed by idiosyncratic episodes and thus, risk diversification through regime arbitrage is possible.
Keywords: market returns; Markov switching model; regime change; European stocks
JEL: G11

Vlora Prenaj, Iliriana Miftari, Besnik Krasniqi

DETERMINANTS OF THE CAPITAL STRUCTURE OF NON-LISTED COMPANIES IN KOSOVO

The main objective of the study was to examine the determinants of the capital structure of Kosovo companies reporting to the Kosovo Council for Financial Reporting (KCFR). The data is collected from the financial statements of 50 non-listed companies and covers the time period of 2013-2018. The data is pannel and three different models: fixed, random effects, and pooled OLS, were estimated in order to test for the best-fitted model of the determinants of the capital structure of Kosovo companies. The size of the company, liquidity, profitability, assets structure, growth, effective tax rate, financial flexibility, and risk were used as explanatory variables for the capital structure of a company measured by the total debt rate. Several theories of capital structure have been developed to explain company-based capital structure. This study is based on the selection of trade-off and pecking order theory. The results of the study suggest that variables such as the size of a company, assets structure, growth, and financial flexibility influence the measurement of the capital structure of a company in Kosovo, and they are supported by the trade-off and pecking order theory. From the results, we can conclude the negative relationship between the size of a company, liquidity, profitability, assets structure, financial flexibility, risk, and capital structure, affects the management of the company when making borrowing choices. The findings of the study demonstrated the importance of capital structure compounds for the decision on the financial sources of a company in Kosovo.
Keywords: Kosovo; determinants of capital structure; trade-off; pecking order; company
JEL: D25; G3; G3

Guy Kpakpo, Elizaveta Ruzina

ANALYSIS OF THE EFFECTIVENESS OF BUDGET DEFICIT FINANCING METHODS IN CÔTE D'IVOIRE USING A CREDIT SCORING MODEL

After reaching the completion point of the Heavily Indebted Poor Countries (HIPC) initiative and the subsequent debt relief, Côte d'Ivoire decided to take the necessary measures to avoid a new public debt crisis. Ten years later, the country is at a crossroads with a rapidly growing debt. Given this situation, it is important to question the effectiveness of the methods of financing the budget deficit in Côte d'Ivoire. This article aims to develop a credit scoring model in order to analyse the efficiency of budget deficit financing modes using a sample of 3222 loan lines from the database of the Department of Public Debt and Grants of Ivory Coast. The results show that loans from bilateral and commercial banks can be considered as "risky" financing. This mode of financing has a less important impact on the probability of default. On the other hand, the results obtained with the estimation of the Logit model show that the probability of default is strongly reduced when the government is financed by bondholders and other debt instruments and multilateral institutions.
Keywords: Public debt; budget deficit; credit scoring; logistic regression; probability of default
JEL: H63; C25

Lela Nurlaela Wati, Momon, Dwi Cahyono

DOUBLE-EDGED SWORD OF CONTROLLING SHAREHOLDERS ON POLITICALLY CONNECTED GROUP BUSINESS

This study aims to analyze the political connections, controlling shareholders, and financial report quality of affiliated companies in Indonesia. The research sample used 884 observations from group companies, and data analysis was performed using moderating regression analysis with panel data. The result showed that political connection weakens the financial report quality of the companies which are controlled by the family, but the role of independent commissioners can reduce the expropriation carried out by family-controlled toward minority shareholders. State-controlled firms have lower financial report quality than those which are family-controlled at all cut-off levels. The existence of political connections in the state companies weakens the effectiveness of the commissioners as a mechanism for the company's internal control.

Yury D. Belkin, Alexey N. Matsuev, Alla V. Ryzhakova, Nadezhda V. Sedova

ASSESSING THE IMPACT OF INVESTMENT PROJECTS FOR THE DEVELOPMENT OF INLAND WATERWAY TRANSPORT ON SOCIAL AND ECONOMIC INDICATORS IN REGIONS

Currently, when preparing substantiating materials for investment projects to be included into governmental programs of the Russian Federation, no assessment is performed of the project's impact on social and economic indicators of constituent entities of the Russian Federation, where the investment project is implemented, such as the GRP, the volume of export and shipment of products of own production, reducing the social inequality and unemployment, increasing the total factor-based productivity. Our research hypothesis is the assumption of the positive impact of implementing governmental investment projects on the indicators of social and economic development in constituent entities of the Russian Federation. Therefore, the purpose of our research is to assess the impact of implementing investment projects for the development of inland waterway transport infrastructure, that are financed from the federal budget, on the social and economic development indicators in constituent entities of the Russian Federation. In our study, we assessed the impact of implementing investment projects for the development of inland waterway transport infrastructure on the social and economic indicators of constituent entities of the Russian Federation using the Difference-in-Differences method and the probabilistic and quantitative assessment of the impact of implementing investment projects on social and economic indicators of constituent entities of the Russian Federation using the Bayesian modelling. The calculations presented in this paper showed that the use of the Bayesian modelling method to assess the probability of the investment projects impact on the indicators of social and economic development in constituent entities of the Russian Federation will allow, before making a decision to launch an investment project, to have an idea about its economic effects for the region. The suggested methodological approach to assessing the impact of investment projects on the social and economic development of regions can be used in the practical activities of public authorities at the stage of selecting investment projects and assessing capital investments.

Emeka Nkoro, Aham Kelvin Uko

FOREIGN DIRECT INVESTMENT IN THE QUEST FOR POVERTY REDUCTION IN NIGERIA

This study examined the direct and indirect impact of foreign direct investment (FDI) on poverty reduction in Nigeria using the Autoregressive Distributed Lag (ARDL) framework for the period 1981-2019. The results of the study revealed that foreign direct investment exerted a significant positive effect on economic growth and economic growth, in turn, significantly contributes to poverty reduction within the period of review 1981-2019. This implies that FDI indirectly contributes to poverty reduction via economic growth. Regarding the direct impact of FDI on poverty reduction, the study shows that FDI significantly exerted an adverse effect on poverty via relatively low income and loss of jobs. Similarly, the study shows that wage and private-sector credit contribute to poverty reduction.
Keywords: Foreign Direct Investment; Poverty Reduction; Economic Growth; Nigeria; ARDL Framework
JEL: F21; F23; O10; O50

Arian Tahiri, Faruk Ahmeti, Burim Prenaj

THE EFFECT OF INTERNATIONAL MIGRANT REMITTANCES ON EMPLOYMENT PATTERNS: EVIDENCE FROM KOSOVO

This study examines the effect of international migrant remittances on the employment patterns of individuals receiving them. To do that we use a nationally representative labor force survey conducted in Kosovo by Millennium Challenge Corporation. To address endogeneity issues, we employ propensity score-weighted Probit models by weighting every individual in the sample by the probability of receiving remittances based on their observed characteristics. The findings suggest that remittances decrease the employment probability of individuals who receive them, while at the same time increasing the probability of inactivity and being a family worker. The impacts are stronger for individuals from urban areas, workers over the age of 55, and individuals from non-Albanian ethnicities.
Keywords: remittances; employment; inactivity; propensity score weighting; Kosovo
JEL: J22; F22; F24; C39

Oleh Kolodiziev, Ihor Krupka, Viktor Kovalenko, Tetiana Kolodizieva, Valentyna Yatsenko, Valeriia Shcherbak

SOCIAL RESPONSIBILITY OF HIGHER EDUCATION UNDER MARTIAL LAW

The system of higher education has always been socially responsible to any society. Currently applied in Ukraine, martial law complicates the conditions of delivering higher education services. According to the analysis results, universities should choose alternative systems of providing educational services depending on the proximity of military operations. Factor analysis revealed significant indicators of quality and social responsibility in higher education provision; the cluster analysis classified the territories according to their actual level of social responsibility according to the location of the universities; the game theory has optimised the social responsibility system of service provision. The study developed two models: clustering the quality of higher education services under martial law and optimising higher education services according to the level of social responsibility. The identified 6 clusters differ in terms of the standard of quality and safety/social responsibility of

higher education services. Based on Ukrainian universities, implementing the developed methodology was achieved as of the spring 2022. As revealed by monitoring of the situation, 32 percent of universities are able to provide higher education services at a sufficiently high level. The aim of the study is to optimise the provision of high quality and socially responsible higher education under martial law. The potential beneficiaries of the research results are students and teachers of Ukrainian higher education institutions located in territories under various degrees of military threats. Optimising the social responsibility system of service provision will improve the quality and reliability by 10 per cent and identify points of growth and stabilisation of at least 15-20 percent.
Keywords: driver indicators; on-line education; Internet sources; war
JEL: C 31; I 23; H53

Radostina Popova-Terziyska, Daniela Ventsislavova Georgieva, Nikolay Neykov

NEEDED SUPPORT FOR FEMALE PRIVATE FOREST OWNERS (SOME RESULTS OF A SURVEY OF DANUBE COUNTRIES)

The aim of the study is to identify needed support for increasing the productivity of private forestry, focusing on the decision-making process in the case of women – private forestry owners in countries of the Danube region. The data used is from a survey in the frame of the project "Forest in Women's Hands".
The methods applied are Regression Ordinary Least Squires (OLS) model and logistic regressions. Statistical correlations are measured to check the impact of some factors affecting female management decisions in turn to outline the needed support.
The results, along with others, show that women involve friends, family members, and spouses in the forest to support them in decision-making, but the requested support is not directed explicitly to increasing productivity. The support provided by the forest associations and government institutions is not effective enough for forest utilisation and productivity. The conclusion that could be drawn is that the needed support is training the private female owners. On the other hand, the study identifies some differences between countries with prevailing private ownership and others.
Keywords: Female forest owners; questionnaire; forest management; decision-making
JEL: M11; Q23

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DO REGIONAL MACROECONOMIC VARIABLES INFLUENCE THE INCOME INEQUALITY IN INDONESIA?

This article examines the effects of government expenditures, regional GDP, regional minimum wages, employment rate, and poverty severity on income inequality by applying the system Generalized Method of Moments panel model to overcome the dynamic endogeneity problem from 2007 to 2020. The results show that government expenditure and an increase in the regional minimum wage for low-wage workers can reduce income inequality in both the short run and long run. Furthermore, high regional GDP and high levels of employment rate for workers with low skills can exacerbate the level of income inequality in the long run. However, reducing the severity of poverty has no effect on reducing inequality. This study provides policy recommendations to the government to improve basic public services and make various training skill programs, including ICT, in order to increase creativity and job opportunities for low-income people.
Keywords: income inequality; government expenditures; regional GDP; regional minimum wages; employment rate; poverty severity index
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