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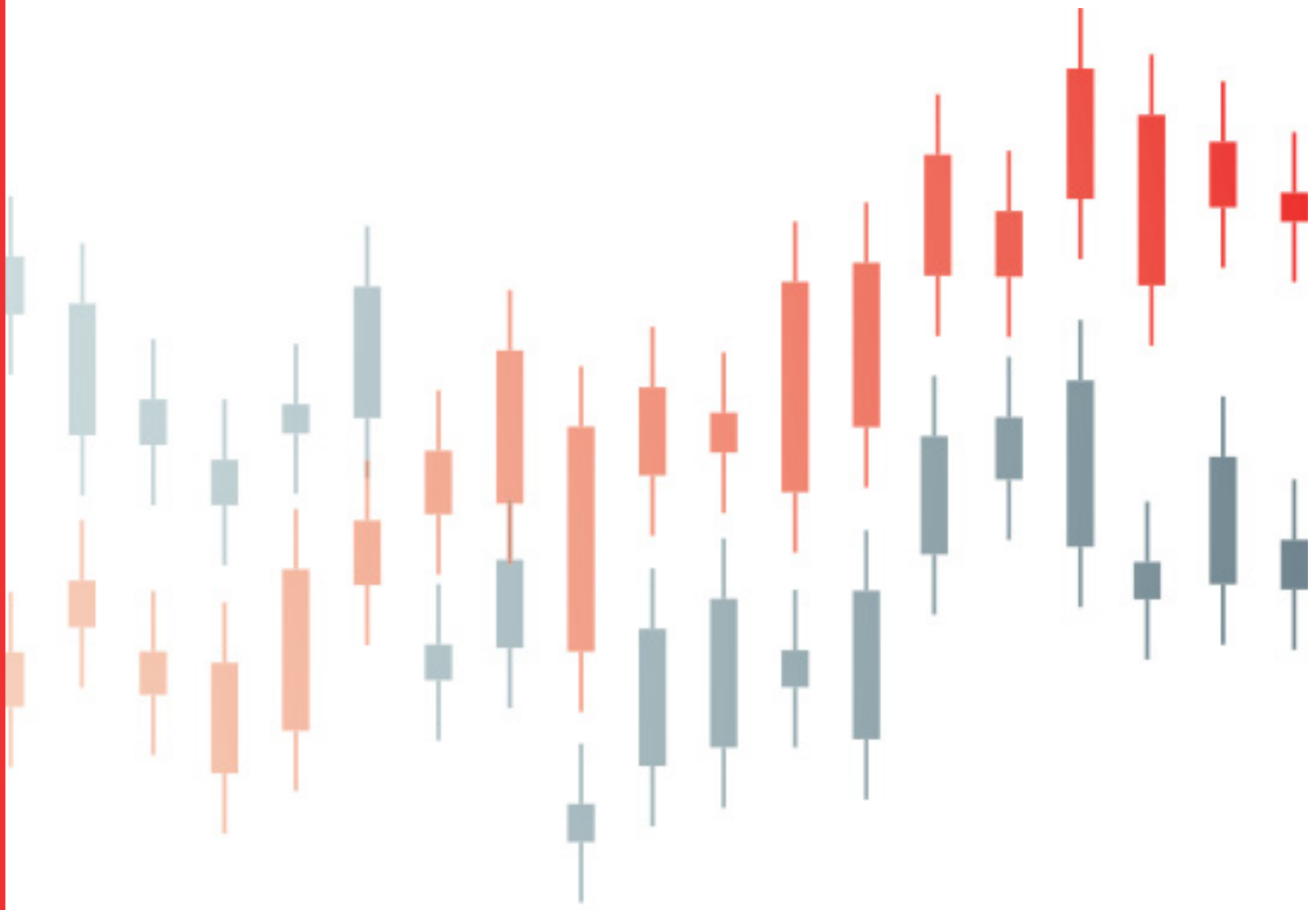

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NOTICE TO READERS

Dear readers and users of our journal,

You notice that this issue in front of you represents an extraordinary edition of the Economics-Innovative and Economics Research Journal. We have decided to issue two printed editions, which are related to the issue of December 2023. It is actually the final winter issue for 2023 (Special Edition 1).

Why have we decided to do this?

There are several reasons:

- The editorial board received very good (positively reviewed) works by authors, in a larger amount than usual, and we decided to publish them without discrimination;
- To enable scientific and professional announcements and results of analyses of economic and technological flows specific for the pandemic period to reach the users as soon as possible;
- We considered it important that authors and readers face each other in their assessments of the consequences of the pandemic crisis straight away.

We are aware that what we have done also poses a certain risk, but we believe that, for all of us, the fact that one issue is printed in two different publications is a smaller problem compared to the volume of one issue, an excessive number of articles or a possible delay in publication.

Thank you for your understanding.

Editorial board

Bijeljina, 25/12/2023

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ENDING 2023

AIMLESS WANDERING IN SEARCH FOR THE GLOBAL CLIMATE COOPERATION FORMULA

PhD Petar Đukić

Asistant Editor in Chief of ECONOMICS – Innovative and Economics Research Journal

At the very beginning of the last month of 2023, when this text was written, and in anticipation of the New Year 2024, as every year at this time, some results of the past - good and bad events in the past eleven months - are summarized. This is done everywhere, starting from the family, local community, city, nation and region, to continents and the global community of peoples. Hardly any of these collectivities can be satisfied with what happened and is still happening in the world. And as for this last twelfth (12) month of 2023, it is almost certain that the processes cannot be reversed in a positive direction as a whole. In the current month, a large UN Climate Change Conference COP28[This text was created at the beginning of December 2023, while COP28 was taking place.] is taking place. The key question of the conference is whether the countries of the world will finally commit to abandoning fossil fuels, even if only gradually, and whether anyone will agree to pay for damages from droughts and floods to poor countries?

A YEAR MARKED BY A COMPLEX OF CRISIS

IIn almost every aspect, today's world is in crisis. Both in general – security crisis, as well as in economic, socio-political, climate, socio-humanitarian and moral. Most of the people on the planet could wish for the New Year that this outgoing one, in no way, be repeated. Namely, everything that happened in the last eleven months should perhaps be forgotten as soon as possible, only if it could happen and if it would even be effective.

However, forgetfulness is a natural ally of people who overcome trials. Well, it somehow suppressed perhaps the only generally favorable fact of the year - the news about the end of the pandemic. On the sixth (6th) of May, this year, the World Health Organization officially declared the end of the COVID 19 pandemic. Unfortunately, it did not mean the end of the danger of the virus, and the return (of new strains and waves) of the epidemic of the COVID 19 virus that was sweeping the world for three and a half years, caused the premature death of many people, left systemic consequences, not only on people's immune system and their habits, but also on politics, economics, psychology, international relations... According to WHO data, there were 5.4 million deaths from COVID 19 only in 2020 and 2021. Mortality data shows that around 14.9 million people likely died due to the health crisis in that period. Even more striking is the fact that only during those two years of the pandemic, there was a global loss of 336.8 million years of human life, which results from the estimate that "for every excess death, 22 years of life are lost", as stated by the WHO.

The COVID pandemic and the huge COVID crisis caused and incited, opened, i.e., exposed, numerous other crises, such as: sectoral economic crises, trade crisis, energy and inflationary, social, humanitarian, and war crises. The entrenchment on the Ukrainian fronts (i.e., the deep-

ening of the conflict and the prolongation of the war), the Sudanese war crisis, the shock of the Hezbollah attack and the spiral of violence in Gaza, and all this shows that the post-pandemic world has not become one bit more cooperative, more tolerant, or less hostile than it was before the attack by a "general and invisible" enemy. Finally, there is an impression that the deepening of the bad effects of climate changes is, among other things, the result of inaction, i.e., falling in a decisive global response and effective global action for the climate.

ECONOMIC ASSUMPTIONS AND BAD SIGNALS FOR 2024

The world is facing economic challenges and no one can say with certainty or assume how they will unfold and how long they will last, not even just in the next year. Perhaps the exception to everything that is on the horizon, and less certain and bad, is that the prospects for reducing inflation, as a global phenomenon, are now more favorable. Namely, the forecasts of a decrease in the global rate of growth of all prices are better than a year ago, and the synthetic indicator of inflation at the world level is finally in single digits. However, stable inflation does not mean stable prices or a calm and balanced market, as an indicator of good and predictable conditions for the restoration of broken supply and production chains. Primary interest rates are extremely high, loans are too expensive, investment decisions are risky and uncertain.

Global growth just flared up after the pandemic depression of 2020 (when the world economy almost collapsed with a drop of about 4%), and after the recovery in 2021, it was stopped by the shocking (pre)war drama and finally by Russia's aggression in Ukraine, in early 2022. Aside deepening confrontations of hostilities around the world, falling standards, jeopardizing the global food and energy market, rising production and trade costs are especially evident on European soil. Another large area of sufferers is represented by the poorest, most populous countries in the world, dependent on the global food supply. Actually, it was they who were previously the most exhausted by the health, safety and social crisis.

Europe and the poorest countries in the world are the most affected by uncertain geopolitical events, the latter both economically, in a socio-humanitarian aspect and even culturally. The new war drama in Europe was logically followed by the energy crisis, the crisis of disrupted supply chains that contributed to the uncertain prospects for growth and the restoration of normal trade and technological cooperation.

SUSTAINABLE DEVELOPMENT AND CLIMATE MEASURES – IN THE JAWS OF A GEOPOLITICAL CRISIS

Regardless of all considerations from the past, the current content and pace of climate policy implementation in the world is not moving at an adequate pace. This is confirmed by the findings of almost all expert teams and researchers of the changes observed during climate measurements, both for the planet Earth as a whole and for almost every major region. Almost every new year is warmer than the previous series on average, and the resources to mitigate climate changes or their destructive effects (including restored forest and other ecosystems, new technologies, immigration and protection against droughts, fires, floods and tsunamis) are not even close to matching new challenges.

Regardless of the effects of certain extremely climate-active regions and countries, primarily in Europe, the global emission of greenhouse gases continues to grow and, in particular, is a key indicator of the deterioration of the atmosphere's structure. It is the concentration of carbon dioxide in the atmosphere which, since exceeding the red line of 400 ppm (1016), already crossed

the threshold of 420 ppm in May 2022. The concentration of carbon dioxide in the atmosphere in May 2022 was 50 percent higher than during the pre-industrial era, reaching levels not seen on Earth for about four million years, as announced on July 3 by the United States' main climate agency.

Data about the planet show that during the last decade of measurements, compared to the corresponding dates a century ago, the average temperature on the Earth has increased by 1.5 degrees Celsius. The reference value is from the time when actions for the climate began, 1990. In those nineties, the measured reference temperatures of the Earth compared to a century earlier, showed an average value higher by only 0.4 degrees Celsius. The intensity of its increase with each subsequent measurement accelerates, so that at the current pace, even with significant pollution prevention and control measures, especially for the harmful emissions of greenhouse gases, shows the average temperature at the end of the 21st century, at least by 2.5% above the level of pre-industrial times. That estimate alone is enough to illustrate the real potential disaster, "Earth on Fire," especially when compared to scientists' estimate that the Earth's ecosystem could handle a temperature rise of barely 1.5 degrees compared to pre-industrial times.

Global warming, no matter how it is caused, shows an acceleration, which is more intense than what was expected when the category of sustainable development was first defined in the report Our Common Future (1987 – Brundtland Commission, OUN). However, thanks primarily to "green" technological innovations, which reduced the use of energy and materials per unit of the monetary product achieved, material and resource efficiency was raised. However, constant measurements of the Earth's response to people's behavior and activity showed that, regardless of many improvements in eco-technological rationality, bad trends and trajectories of (un) sustainable growth, production, employment and income have not been reversed, nor even stopped. What is more, expert estimates state that even after the moment of stopping the growth of harmful emissions (by restructuring the entire economy to a carbon-neutral one), global warming would continue to occur for a certain period of time.

The category of sustainable development (sustainable development is defined as development that is unquestionable...), no matter how fluid, sometimes ambiguous, even tautological, contributed to the conception and implementation of elements of the economy that are less threatening to the environment and resources, corresponding to a greater extent to socio-humane needs of people and at the same time ensuring the growth of production, income and employment primarily on the basis of greater use of intangible resources such as knowledge, information, and skills. In almost all parts of the world, it has started to be said that intangible resources can, as a whole, compensate for the lack of material and other natural resources, so essentially a sustainable economy is a "smart economy" or an economy based on knowledge. In the following stages of the development of "ecological awareness", lexical innovations mainly went in the direction of connecting economic and technological rationality based on the common, first of all, "green" denominator, that is, in the direction of green economy in the broadest sense. Thus, at the end of the 20th century, the use of the prefix eco (eco-industry or industrial ecology) intensified in the sense of the wide application of something that is "friendly" to the environment, useful for the environment, recyclable, cost-effective (in terms of resources and energy).

Conceptually, the category of circular economy, which supposedly encompasses all factors and interrelationships of processes and procedures in which material and energy are used without residue, has been reached. Further evolution directs these terminological contests towards the category of eco-bio-economy or even more circular (bio)economy. Now, it seems even too much because the prefix bio would exclude the word "circular" in a consistent interpretation, given that biological processes, as the processes of natural circulation of matter between the

living and non-living world, are rounded (circular). When climate came into a word game as a metaphorical expression of everything that is not good for the relationship between man and nature, and supposedly all of this can be manifested in climatic changes, the matter became complicated to a considerable extent when a new phrase entered the scene: climate economy. Theoretical or rhetorical innovations, whatever, the formula of global climate strategy and policy was found. The only problem is that there is no one to implement it as a whole.

CURRENT AND PERMANENT CLIMATE SOLUTION AND SECURITY

It is as if today's climate action (at least for a while) has lost its global and multilateral character. We should not forget that all countries, especially the world's biggest polluters, in Paris - (2015), signed the content of the agreed actions for the climate, which included self-limitation of harmful emissions (decarbonization), and even establishing the global climate transition green fund, through which it should turn annually about 100 billion dollars intended to help low-income countries by developed countries in order to undertake a serious energy transition. Then Trump happened to America, and his measures among the first ones were to cancel cooperation regarding climate actions, all with an anti-immigrant policy under the pretext of "America first". After that, the COVID pandemic came, slowing down all global actions, including coordinated measures against the pandemic. It was followed by the COVID crisis through the drop in production, employment and income, as well as measures to falsely rehabilitate the social crisis by distributing "helicopter money". The high inflation as a global phenomenon was followed by the energy crisis, then new military aggressions (for old strategic interests), the wartime destruction of people, infrastructure and environment, with no end in sight (Ukraine, Sudan, Palestine...). What is next?

Actually, 2021 ended long time age and, in the meantime, new neuralgic global circumstances have appeared, accompanied by notorious and often counterproductive sanctions with open disagreements, both in terms of geo-economics, strategic military-political goals, and agreed climate measures. For the holders of the greatest global power, who essentially act almost uniquely, like the modern "horsemen of the Apocalypse", everything else at this moment seems to be more important than saving the Planet.

At the global climate summit COP28, which has just started, there is no more Trump nor Putin. However, it does not mean that the chances are much more certain, and this year's COP28 conference, which takes place in Dubai from November 30 to December 12, despite the extremely likable green rhetoric, is full of controversy:

- First of all, it is happening in the Emirates, a country that has based its entire development so far, including prospects, on oil exploitation;
- It gathers as many as 70 thousand participants, from politicians and experts to business people, young people from the non-governmental sector, who flew to Dubai from all over the world by planes – the largest consumers of non-renewable energy per user;
- The representatives of China and Russia, which together emit almost 30% of greenhouse gases, will not appear at the summit with prominent teams;
- At the summit, most likely, judging by the pre-prepared schedule, there will be no discussion on how to reach an acceptable global peace (or at least a truce) for the sake of agreement and perspectives of joint action for the climate.

As for the "programme objectives of COP28", they are likely to be even more radical than at previous conferences. The key objective of the meeting is once again to keep the sudden in-

crease in the Earth's temperature below +1.5 degrees Celsius compared to pre-industrial times. In order to achieve this, COP28 participants have accepted the following in advance:

- to triple the share of renewable energy;
- to double energy efficiency by 2030,
- to completely abandon the use of fossil fuels, as well as to achieve the peak of their share before 2030.

It will be an objective not easily achievable, especially since the economic and geopolitical assumptions of a stable and permanent international cooperation on every level, even on the climate level, are rather slim and there is very little time left until 2030. The author of these lines does not have very optimistic expectations for the outcome of the December climate conference in Dubai, which gathered the largest number of participants so far. Rather, it could be assumed that, regardless of the declarative support for measures and goals concerning decarbonization, a small number of countries of the developed world will be ready to participate in the financing of an unfortunately very promising transition fund (global financing of climate actions) that would have to approach the level of a minimum of 500 billion dollars per year to finance the fair energy transition.

And it is hard to talk about the idea of establishing a special fund to rehabilitate the consequences of floods and droughts in poor countries that, more than others, are exposed to climate changes in combination with the humanitarian crisis. For the simple reason that, after the pandemic, energy and geopolitical crisis, nobody in the world is in a good position from an economic aspect, so there is less and less will for global cooperation at the level of countries that would exclude themselves from the list of losers.

It is more likely that soon, like on those images from Glasgow 2021, we will once again see the endless "green" rhetorical parades of politicians, as well as the vividly colorful marching processions of younger environmentalists who are looking for a "transition from words to actions" without really knowing what it all should mean. There will also be hundreds of different messages, both from passionate street speakers and "green" tourists from Dubai, as well as those from business circles prone to "green washing". But it should be borne in mind that there are many more who could not even come to Dubai, even though they had something to say there. The world is all around us, and most of it belongs to the poor South, which is often unable to demand anything.

WHAT CAN THE SMALL AND THE POOR DO?

The conclusion drawn from all of this should not be that the global climate action has failed, either in terms of agreed measures for prevention or adaptation/mitigation of their effects. Things will change in accordance with changes in current geopolitical events and other major controversies.

There is a huge number of possible actions that small countries could take in order to make life easier for themselves, reduce risks and contribute to the sustainability of the situation in which the world and the region are. Smart economy and climate policy should be superior to all other policies and ideologies.

It is possible to introduce many small actions such as better protection and regulation of watercourses, irrigation and control of efficient agricultural techniques, risk insurance, improvement of fire, earthquake and urban safety, up to "green" infrastructure, introduction of internal taxes for exceeding harmful emissions, raising forest protection belts, better traffic control, repairing

bridges and highways. Better technical protection and reduction of traffic risks, e.g. the safety of railroad crossings, etc., are not very demanding measures, the absence of which takes a huge toll, which can be prevented. Sustainable construction and housing, constant efforts to improve energy efficiency, final management of production, distribution and energy consumption flows, offer enormous opportunities for savings, and therefore business plans and new jobs. Sustainable means not only ideal “green”, clean and renewable, but also safe and of high-quality, more efficient, and, of course, cleaner, at least little by little...

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Editor in Chief

CONTENTS

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THE POTENTIAL OF INFORMAL INSTITUTIONS IN PROMOTING GREEN ENTERPRENEURSHIP (GE) AND SUSTAINABLE SOCIO-ECONOMIC DEVELOPMENT

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ABSTRACT

The continuity of the green environment, economy, and entrepreneurship is essential for sustainable development. Therefore, this research aims to explored the potential of informal institutions in promoting Green Enterpreneurship (GE) and sustainable socio-economic development. The method employed used microeconomic data rooted in local wisdom, social norms, and localized moral commitments from various regions of Indonesia. Data collection comprised surveys and structured interviews relevant to the research objectives. Quantitative data material was obtained by conducting a field survey of 150 household samples of green entrepreneurship respondents taken representatively in various regions using simple random sampling techniques. The design employed a two-stage mixed-method approach, including exploratory and explanatory designs. The result showed the significance of Green Enterpreneurship (GE) in mitigating the impacts of global climate change and economic crises, thereby contributing to the attainment of sustainable development goals. However, the main results of the research confirm that the capacity of formal institutions has not been able to navigate the complexity of these problems isssues is limited. Conversely, informal institutions, though capable of mitigating global climate change and advancing sustainable development, remained localized and lacked national and global integration and collaboration. Green Enterpreneurship (GE), as a form of social innovation, gave rise to new models of socio-economic solidarity within unique local communities. The research also underscored the pivotal role of informal institutions in facilitating these endeavors, thereby filling a void in high-quality new institutional economic theory

Keywords: *Informal Institutions, Green Enterpreneurship and Sustainable Socio-Economic Development*

1. INTRODUCTION

The concept of Green Enterpreneurship (GE) has proven increasingly effective in achieving sustainable development goals (SDGs), which is a fundamental pillar in sustainable development (Vasilescu et al., 2023). However, the theoretical foundation of this research remains relatively unexplored due to the complexity of the phenomenon (Misztal and Kowalska, 2023; Prasetyo et al., 2023). The process of fostering Green Enterpreneurship (GE) and establishing new institutional resource-based environments are indispensable drivers of sustainable socio-economic development. The innovative capacity and awareness of the millennial generation are key

factors in this endeavor (Nikolaou et al., 2018; Prasetyo et al., 2022a; Genoveva and Tanardi, 2022; Rudaku et al., 2023). Prior research has drawn attention to institutional gaps, particularly in supporting female entrepreneurs to mitigate gender disparities in Green Enterpreneurship (GE) (Prasetyo et al., 2023; Pindado et al., 2023). Despite this, Green Enterpreneurship (GE) is currently seen as a form of social innovation aimed at promoting sustainable, inclusive economic growth to reduce unemployment and poverty (Štilić et al., 2023; Prasetyo et al., 2023).

One of the primary objectives of the SDGs for 2030 is to expedite progress toward sustainable development by increasing peaceful, inclusive societies (Cassar 2022). This is to be achieved by establishing effective, accountable, inclusive, and just institutions at all levels (de Soysa and Jütting, 2023). These endeavors can be realized through the adoption of new institutional policy models that stimulate social innovation in the socio-economic development of disadvantaged communities (de Soysa and Jütting, 2023). Evaluations of new business models with innovative high-tech solutions have proven more effective in promoting social-economic solidarity (SSE) and enhancing the efficiency of sustainable socio-economic development (Kuzmak and Kuzmak, 2023; Prasetyo et al., 2023; Shyshkova et al., 2022). Accordingly, OECD countries have asserted that social economy acts as a driver of social innovation, subsequently supporting new economic models within society (OECD, 2022).

Recent investigations have examined the environmental impact of institutions on social entrepreneurship, with few on the role of Green Enterpreneurship (GE) (Prasetyo et al., 2022b). The moderate role of informal institutional potential in promoting Green Enterpreneurship (GE) and sustainable socio-economic development has remained unclear (Prasetyo et al., 2023). Preliminary research found that informal institutions have a greater impact on entrepreneurial opportunities than formal ones (Aparicio et al., 2016; Alwakid et al., 2021). According to empirical evidence, the quality of informal institutions has a more significant impact on the quantity and quality of entrepreneurship in developing countries compared to developed ones (Chowdhury et al, 2019; Sedeh et al., 2022; Zhuang and Sun, 2023). However, research focused on the empirical examination of informal institutions on Green Enterpreneurship (GE) as a form of social-economic innovation related to sustainable development is lacking. This is because informal institutions are known to have a more significant effect on economic, and organizational behavior by creating localized social norms and moral commitments (Zhuang and Sun, 2023).

Informal institutions have been shown to play a role in increasing public awareness of environmental issues (Shi and Xu, 2018; Zhang et al., 2019; Gaganis, 2021). However, the potential of informal institutions in this context has received less attention. The primary urgency of this research is to explore the role of informal institutions, particularly localized ones in developing countries like Indonesia, by promoting Green Enterpreneurship (GE) and achieving SDGs. The core issue at hand is how the interaction between informal institutions and new social innovations through Green Enterpreneurship (GE) can be conceptually and practically beneficial. The specific objective of this research is to elucidate the interaction in exploring the potential of informal institutions in driving Green Enterpreneurship (GE) and sustainable socio-economic development. The contributions of this research include providing an understanding of the role of informal institutions in filling the gap, which has remained untouched by formal institutions, both theoretically and practically. The argument here is that sustainable socio-economic development is a unique endeavor, requiring consideration of the spatial scale and the understanding of the underlying processes (Zetterberg et al., 2023). Consequently, there are no “magic bullet solutions” that can guarantee sustainable development at the local level (Mijajlović et al., 2021). Nevertheless, policy actions and interventions should effectively address the complexity of the issues, promoting inclusivity and fairness at all levels (de Soysa and Jütting, 2023; Zetterberg et al., 2023).

2. REVIEW LITERATURE

2. 1. THE RELATION OF FORMAL AND INFORMAL INSTITUTIONS

The absence of both formal and informal institutions has a direct impact on entrepreneurial productivity and serves as a hindrance to entrepreneurial behavior (Webb et al., 2023). Therefore, the roles of both formal and informal institutions are crucial for the development of a nation, even though prior literature has predominantly concentrated on formal institutions (Emilia, 2016; Ugyel, 2018; Prasetyo and Dzaki, 2020). The significance of informal institutions has been on the rise, particularly in their contribution to public services and increasing the competitiveness of a nation (Ugyel, 2018; Lindorfer et al., 2023; Candea et al., 2023; Prasetyo et al., 2021). As a result, new institutional theory literature has assumed institutions to be dynamic rather than static (Tae-Hee, 2019; Koning, 2016). In practice, institutions often coexist, comprising a mix of formal and informal elements (Fuentelsaz et al., 2021; Lee and Law, 2016). Formal and informal institutions operate in tandem by reinforcing each other, thereby making their interaction a pivotal aspect of the new institutional perspective (Lindorfer et al., 2023; Gërxhani and Cichocki, 2023). Nevertheless, previous research (North, 1990), has clarified that the most influential institutional factors are frequently found within the realm of informal institutions.

There is a notable emphasis on one of the most promising avenues for future research, which is to delve into the potential of integrating informal institutions into institutionalism (Tae-Hee, 2019; Koning, 2016). New institutional economics presents a valuable theoretical framework for understanding economic organizations and social culture as well as for introducing a distinctive approach to researching socio-economic and political dynamics (Tae-Hee, 2019; Dimaggio and Powell, 2013). In light of this, both formal and informal institutions must continue to occupy a central position within the new institutional perspective, both in theory and in practical applications (Prasetyo et al., 2022b; Lindorfer et al., 2023).

Extensive literature research has been carried out to explore the relationship between informal entrepreneurial orientation and institutional theory (Sorensen, 2017; Williams, and Bezeredi, 2018). In recent years, new institutionalist theories have emerged to elucidate the prevalence of entrepreneurship in the informal sector (Sorensen, 2017; Fabris, 2022; Mićić, and Mastilo, 2022; Kabir et al., 2023). Consequently, literature research that primarily focuses on examining the connection between entrepreneurial orientation and informal institutional theory remains relatively scarce (Prasetyo et al., 2022b; Sendra-Pons et al., 2022; Muralidharan and Pathak, 2017). The argument posited is that the failure of formal institutions has resulted in an asymmetry between formal rules and the values, norms, beliefs, and participation in the informal sector, as these aspects are not significantly influenced by formal institutions (Prasetyo et al, 2022b; Sorensen, 2017).

According to preliminary research, both formal and informal institutional approaches are important in affecting the stages of innovation performance of a nation (Lee and Law, 2016; Kurtulmuş et al., 2020). However, informal institutions, specifically through the dimensio (Lee and Law, 2016), of social capital, exhibit a positive and significant correlation with higher stages of innovation (Lee and Law, 2016). In terms of trust in the legal system and formal institutions, informal institutions negatively impact economic innovation performance (Kurtulmuş et al., 2020). This process increasingly underscores the intricacy of the fundamental theory regarding the relationship between informal institutions and social innovation in Green Enterpreneurship (GE) related to sustainable development models. Informal institutional approach is a complex and vital socio-economic phenomenon that is both intriguing and warrants further examination.

2. 2. THE RELATION OF INFORMAL INSTITUTIONS AND GREEN ENTERPRENEURSHIP

Research into the specific relationship between informal institutions and Green Enterpreneurship (GE) is gaining increasing significance, yet the existing standard literature in this domain remains limited (Prasetyo et al., 2023; Nikolaou et al., 2018; Alwakid et al., 2021; Kurtulmuş et al., 2020). Literature research has been conducted on the role of informal institutions in driving sustainable economic growth through the dynamic performance of female entrepreneurs (Cismaș et al., 2023; Prasetyo et al., 2023; Kabir et al., 2023; Godlewska, 2021). In addition, a global database and standardized theories have not been found, which has led to the need for further experimental examinations using various approaches to explore Green Enterpreneurship (GE) (Alwakid et al., 2021). The analytical context and theoretical foundation for such research can be rooted in resource-based institutional factors (Nikolaou et al., 2018). Therefore, there is need for concerted efforts to establish more consistent and uniform information concerning Green Enterpreneurship (GE) and its resultant impacts (Haldar, 2019).

Mitigating global climate change necessitates the cultivation of various capacities within informal institutions that are not only more effective but also accountable at the international, national, and local levels (de Soysa and Jütting). Literature findings have shown that various informal institutions are significant determinants of strong economic development (Saleem et al., 2022; Urbano et al., 2021; Williamson, 2009; Dubyna, 2021). The theoretical dimension for gauging informal institutions is often categorized through concepts like relationships, solidarity, trust, social norms, social capital, networks, and alliances (Williamson, 2009; Laskaiev et al., 2023; Matos et al., 2023). This is in addition to the sustainability of informal institutions depends on the foundation of informal network functions (Murimbika and Urban, 2023). The potential of local government institutions has not been extensively explored in existing literature, leading to much confusion and threats to the sustainability of local informal and local government institutions (Alexeev et al., 2021).

Contemporary literature research is gradually converging and highlighting the effectiveness and adaptability of informal institutions within international, national, and local strategies (Vasilescu et al., 2023; Prasetyo et al., 2022b; Minbaeva et al., 2023; Cristea and Caragiani, 2022). Therefore, informal institutions are now playing an increasingly vital role in balancing and filling the gaps left by formal institutions in the markets of developing countries (Vasilescu et al., 2023; Prasetyo et al., 2022b; Nguyen et al., 2019). These insitutions have influenced all aspects of international business, with limited attention in various literature (Minbaeva et al., 2023). The two-way causality between institutions and Green Enterpreneurship (GE) has only been confirmed in countries driven by innovation in the long term (Dau et al., 2022). Previous research has stated that fertility rates are negatively related to long-term inclusive economic development, including female workforce participation (Li et al., 2022).

However, specific research on the causality and effect of informal institutions on Green Enterpreneurship (GE) in innovation-poor and gender-unequal developing countries is still limited, thereby they must be concluded with caution. Regional disparities in sustainable development can be exacerbated by variations in the level of innovation within different communities (Samadi, 2019). Consequently, the potential of Green Enterpreneurship (GE), driven by social and economic solidarity, to harness resources is underutilized (Prasetyo et al., 2023). The argument put forth is that resource ownership is highly intricate, and the mechanisms of informal regulation are distinctive and difficult to measure precisely (Prasetyo et al., 2023; Debnath and Das, 2022). Previous research results show significant differences in the operational patterns

of Green Enterpreneurship (GE) between developed and developing countries (Prasetyo et al., 2023; Debnath and Das, 2022). Moreover, Green Enterpreneurship (GE) is predominantly undertaken by women, who still face gender bias (Vasilescu et al., 2023).

Gender equality within the diversity of entrepreneurship, viewed through the lens of institutional theory, is increasing significantly (Prasetyo et al., 2023). In principle, these informal institutions possess the potential to enhance the socio-economic well-being of women through entrepreneurial endeavors, particularly in rural areas (Kabir et al., 2023). However, unfavorable conditions may arise due to inadequate funding, labor market conditions, and socio-economic norms (Alpsahin, 2023). In practical terms, entrepreneurship is often characterized by uncertainty and failure. When entrepreneurial ventures face business failure, it places a substantial economic and social burden on individuals. The extent of this burden often varies according to the type of related institution, thereby affecting decision-making and entrepreneurial behavior (Peprah et al., 2023). Consequently, policymakers aiming to increase economic well-being through increased entrepreneurship need to carefully select the 'type' of entrepreneurship to focus on and subsequently choose more suitable policies (Guerrero and Lira, 2023). The urgency of this research becomes increasingly important in examining how informal institutions can support Green Enterpreneurship (GE) and sustainable rural socio-economic development in developing countries such as Indonesia. The objective of this research is to explore and identify this potential to support the achievement of SDGs.

2. 3. INSTITUTIONS, GREEN ENTERPRENEURSHIP (GE), AND SUSTAINABLE DEVELOPMENT

Institutionally, Green Enterpreneurship (GE) has become a significant momentum related to dynamic innovation performance in sustainable business activities (Lee et al., 2022; Thurik et al., 2023). Innovative performance in Green Enterpreneurship (GE) serves as a significant mediator in the connection between environmentally friendly dynamic capabilities and sustainable performance (Nordin and Hassan, 2019). Therefore, strategic policies and related institutions have been established to provide support for Green Enterpreneurship (GE) (Prasetyo et al., 2023; Appiah et al., 2023). Green Enterpreneurship (GE) has progressively integrated with various other disciplines to strengthen entrepreneurship and new institutional theories (Thurik et al., 2023). Integrated technical orientations that foster collaboration with the environment have promoted Green Enterpreneurship (GE) and the organizational capacity for institutional mitigation, thereby further supporting green innovation (Thurik et al., 2023). Previous research has confirmed the major roles played by educational institutions and the media in influencing entrepreneurs understanding of Green Enterpreneurship (GE) (Mukonza, 2020; Beiwei et al., 2023; Sulastiningsih et al., 2023). The results indicated that Gender and Social Inclusion (GESI), as well as community institutions, increasingly drive sustainable Green Enterpreneurship (GE) (Prasetyo et al., 2023).

The symbiotic relationship between Green Enterpreneurship (GE) and sustainable development underscores the need for robust institutional policy capacity (Nikolaou et al., 2018; Aurellia and Nuringsih, 2020). For instance, the results stated that Green Enterpreneurship (GE) influences green product development, which subsequently affects marketing performance (Alamsyah et al., 2023). Several models have not explored the potential of institutional capacity concerning the symbiosis of GE with sustainable development, both theoretically and practically (Prasetyo et al., 2022a). Green Enterpreneurship (GE) is fundamentally a component of social entrepreneurship, driven by the objective of mitigating environmental impacts to attain sustainable goals (Neumann, 2022). Meanwhile, the theoretical foundation of Sustainable Development

Goals (SDGs) remains underdeveloped (Prasetyo et al., 2022a; Wang et al., 2023). and there is no standardized theory of sustainable development that encompasses all aspects. Specifically, there has not been an in-depth exploration of the influence of the green market on sustainable development and its interconnectedness with Green Enterpreneurship (GE) (Wang et al., 2023).

Recently, there has been a growing increase in the fundamental concept of sustainable development through Green Enterpreneurship (GE) within the framework of new institutional theory (Alwakid et al., 2021; Swain and Yang-Wallentin, 2020). However, it is important to recognize that the embedded paradox of Green Enterpreneurship (GE) within institutional environments is a barrier to achieving SGDs (Swain and Yang-Wallentin, 2020). Understanding the various dimensions of institutional elements that shape both formal and informal institutions can have a significant impact on supporting and preventing entrepreneurial migration (Gupta and Dharwal, 2022). Informal institutions can serve as complements, substitutes, accommodative entities, or competitors to formal institutions (Minbaeva et al., 2023). When formal institutions are effective and align with informal institutions, they can complement each other (Prasetyo et al., 2023; Minbaeva et al., 2023). Conversely, when they are not in sync, they may assume an accommodative role (Minbaeva et al., 2023). In cases where formal institutions are ineffective but align with informal institutions, informal institutions can act as substitutes (Prasetyo et al., 2023). When they do not align, informal institutions tend to take on a more competitive role (Minbaeva et al., 2023).

Furthermore, one approach emphasized that informal institutions emerge as a response to the void left by formal institutions (Shu et al., 2021). Theoretically, the development of informal institutions is linked to the formal institutional environment in which entrepreneurship functions (Fuentelsaz et al., 2019). The absence of both formal and informal institutions has a detrimental effect on productivity and poses barriers to entrepreneurial activities (Webb et al., 2020). The intricate nature of institutions can have adverse consequences on resource use, leading to decreased productivity and reduced entrepreneurial competitiveness (Prasetyo et al., 2022b).

3. RESEARCH METHOD

The research method employed to address the problem and objectives involves a two-stage mixed methods research design comprising exploratory and explanatory designs. These designs aimed to explain the significant role of informal institutions and Green Enterpreneurship (GE) as models for creating innovations and driving sustainable development. Given the problem and objectives, the method is categorized by an exploratory approach, which is the initial step to identify and describe various related factors. In contrast, the explanatory design leans more towards statistically substantiating the roles played by these associated factors. The fundamental analytical model applied is multiple regression path analysis. As an initial step, after all variables have been explored and measured with the appropriate dimensions, various regression models are experimented with to determine the best simple model in the form of path analysis.

The choice to employ this experimental method is underpinned by the absence of a comprehensive global database and a standardized theory pertaining to the connection between institutional investigations and Green Enterpreneurship (GE) in the context of sustainable development (Alwakid et al., 2021). Additionally, the foundational concept of sustainable development still lacks robustness (Neumann, 2022), necessitating the exploration of various innovative approaches to generate more consistent and cohesive information (Haldar, 2019). This research used a standardized regression model in the form of path analysis, operating under the assumption that this model provides uniform and consistent standardized coefficient information. Tech-

nically, this path analysis model is considered not to violate classical assumptions, especially heteroskedasticity.

Subsequently, the operational definitions and measurement dimensions for each variable used are established using the Gini ratio index value technique. This technique has been extensively covered in prior research, and for academic ethical reasons, it does not need to be reiterated in this context. Consequently, the mixed methods research design commences with a qualitative method, featuring exploratory analysis, and is complemented by a quantitative method. The exploratory, descriptive quantitative analysis method is employed to elucidate each phenomenon that has been uncovered, measured, identified, and meticulously formulated within the experimental test.

The model presented in this paper was formed using key variables related to the research objectives. These include Green Enterpreneurship (GE), Social Entrepreneurship (SE), Informal Institutional (InIn), Standardization (St), Commercialization (Cz), Technology (Tg), Productivity (Pd), Investment (Iv), Social Capital (SC), Human Capital (HC), and Sustainable Development (SDGs). The objective is to provide a better understanding of the Green Enterpreneurship (GE) phenomenon and the role of informal institutions. Therefore, to facilitate the research activities, a relevant research design and a flowchart of steps derived from the framework and the roadmap were created. A structural equation model of path analysis regression equations was formulated for more accessibility as follows.

$$GE_i = \alpha_0 + \beta_1 SE_i + \beta_2 InIn_i + \beta_3 St_i + \varepsilon_1 \quad (1)$$

$$GE_i = \alpha_0 + \beta_1 SE_i + \beta_2 InIn_i + \beta_4 St_i + \varepsilon_2 \quad (2)$$

$$GE_i = \alpha_0 + \beta_1 SE_i + \beta_2 InIn_i + \beta_5 St_i + \varepsilon_3 \quad (3)$$

$$GE_i = \alpha_0 + \beta_1 SE_i + \beta_2 InIn_i + \beta_6 St_i + \varepsilon_4 \quad (4)$$

$$GE_i = \alpha_0 + \beta_1 SE_i + \beta_2 InIn_i + \beta_7 St_i + \varepsilon_5 \quad (5)$$

$$GE_i = \alpha_0 + \beta_1 SE_i + \beta_2 InIn_i + \beta_8 SC_i + \beta_9 HC_i + \varepsilon_6 \quad (6)$$

$$SDGs_i = \alpha_0 + \beta_1 SE_i + \beta_2 InIn_i + \beta_9 HC_i + \beta_{10} GE_i + \varepsilon_7 \quad (7)$$

4. RESULTS AND DISCUSSION

Informal institutions are understood as a set of moral ethics or unwritten norms, habits, and commitments embraced by a local community, emerging as a form of social-economic solidarity. Some examples of informal institutional organizations in Indonesia are informal labor unions or volunteer organizations that emerge during disasters caused by global climate change, COVID-19, or economic crises. Currently, the potential of these informal institutions is steadily expanding, transforming them into a fundamental pillar of regional and national economies and even a burgeoning political influence in Indonesia. Formal institutions often encounter limitations in grappling with the intricacies of various issues, including corruption. However, the function of informal institutions is complementary in nature, aimed at filling gaps rather than conflicting with formal institutions. These informal institutions are designed to achieve goals that should be carried out by formal institutions, which are often ineffective and sometimes ignored by existing formal institutions.

Furthermore, this research broadens the scope of informal institutions to address the deficiencies in formal institutional theory. It is guided by the aspiration to gain a deeper insight into the capabilities of informal institutions and the challenges posed by global development. The underlying premise is that, both in theory and practice, informal institutions exert influence on the direction of Green Enterpreneurship (GE) activities, thereby rendering them more effective. The research framework is primarily centered on the exploration of Green Enterpreneurship (GE) as a novel form of social innovation capable of mitigating the adverse consequences of global climate change and propelling sustainable development. From this perspective, the objective of this research is to offer a fresh perspective on how informal institutions can enhance the efficiency of Green Enterpreneurship (GE), thereby mitigating the detrimental effects of climate change and advancing the goals of sustainable socio-economic development.

This research operates under the assumption that Green Enterpreneurship (GE) represents a distinctive form of local socio-economic innovation primarily facilitated by informal institutions in Indonesia. Green Enterpreneurship (GE) emerged in response to the Indonesian government pro-green economy development strategy. However, the existing formal institutions are often incapable of effectively managing all pro-green economy activities as they should, which leads the Green Enterpreneurship (GE) to be primarily driven by the collective awareness and spirit of local communities. The transaction costs of Green Enterpreneurship (GE) were initially low when it first emerged, but currently, transaction costs are becoming increasingly higher with the rising role and political processes.

Furthermore, this research underscores that Green Enterpreneurship (GE) possesses distinct and localized sources of competitive advantage, making it a prevailing trend in sustainable development across various regions. The operationalization of Green Enterpreneurship (GE) remains challenging, both in theoretical and practical terms, primarily due to the absence of a standardized conceptual definition. Social entrepreneurship is an innovative endeavor primarily motivated by social equality goals and driven by solidarity. Green Enterpreneurship (GE) refers to innovative business endeavors that are more actively focused on mitigating the adverse effects of global climate change and economic crises while being grounded in economic solidarity (Prasetyo et al., 2023). The integration and amalgamation of these two concepts are often referred to as green social entrepreneurship (Prasetyo et al., 2021). Therefore, green social entrepreneurship is primarily focused on innovative entrepreneurs who aspire to mitigate the negative impacts of global climate change and economic crises but also to achieve socio-economic development goals that are environmentally friendly for the sustainable well-being of the community.

In essence, minor differences are primarily related to their main motivation rather than the associated activities. Fundamentally, both are driven by the spirit of socio-economic solidarity (SSE) to mitigate economic crises and global climate change while promoting environmental SGDs. The primary function is to be a positive response to the impacts of formal institutional policy implementation, as these institutions have not yet navigated more effectively, inclusively, justly, accountably, and peacefully to sustainably achieve community well-being and sustainability. The main goal of Green Enterpreneurship (GE) is to reduce the adverse effects of global climate change and economic crises on environmental, economic, and social damage.

Table 1. Results of standard coefficient analysis of local wisdom role in Green Enterpreneurship (GE)

Model		Unstandardized Coefficients		Standardized Coefficients	t-stc	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-.114	.029		-3.914	.000		
	Social_Entrepreneurship	.416	.057	.382	7.273	.000	.535	1.868
	Informal_Institutional	.503	.081	.388	6.172	.000	.373	2.677
	Standardization	.245	.050	.267	4.925	.000	.502	1.991
2	(Constant)	-.098	.032		-3.013	.003		
	Social_Entrepreneurship	.432	.059	.396	7.262	.000	.539	1.857
	Informal_Institutional	.499	.095	.386	5.255	.000	.298	3.354
	Commercialization	.202	.057	.230	3.551	.001	.384	2.607
3	(Constant)	-.108	.032		-3.370	.001		
	Social_Entrepreneurship	.389	.062	.357	6.280	.000	.503	1.986
	Informal_Institutional	.553	.088	.427	6.249	.000	.349	2.867
	Technology	.203	.062	.215	3.272	.001	.378	2.644
4	(Constant)	-.099	.039		-2.512	.013		
	Social_Entrepreneurship	.389	.068	.358	5.763	.000	.447	2.236
	Informal_Institutional	.587	.104	.454	5.623	.000	.265	3.775
	Productivity	.144	.078	.162	1.847	.067	.224	4.468
5	(Constant)	-.114	.033		-3.426	.001		
	Social_Entrepreneurship	.457	.061	.419	7.441	.000	.533	1.875
	Informal_Institutional	.548	.104	.424	5.252	.000	.261	3.836
	Social_Invention	.148	.063	.160	2.352	.020	.367	2.724

Dependent Variable: Green Enterpreneurship (GE)

Source: processed by authors

Presently, Green Enterpreneurship (GE) in Indonesia has become increasingly important and relevant as a mitigation measure against the impacts of global climate change and a driver for achieving SDGs. In theoretical and practical terms, the existing literature is challenging to navigate due to the complexity of the discipline, which becomes more apparent when Green Enterpreneurship (GE) is linked with sustainable socio-economic development. This sustainable development is not limited to the sustainability of physical environmental development but mainly to socio-economic community well-being. Therefore, through an integrative examination that incorporates the role of existing informal institutions, this research attempts to introduce a new typology concerning the relation of these informal institutions in driving Green Enterpreneurship (GE) and sustainable socio-economic development. Based on the results of the path analysis in the three tables and Figure 1, this connection is now more easily understood empirically and theoretically. This research expands on the pathway of informalization within new institutional theory and entrepreneurial theory concepts, offering increasingly pertinent practical policy implications.

This research offers comprehensive insights into new institutional theory within the context of localization in developing countries like Indonesia, highlighting the increasing significance of informal institutions (North, 1990). It also attempted to present three groups of quantitative empirical models related to Green Enterpreneurship (GE) and the primary role of informal in-

stitutions. The discussion starts with the potential role of informal institutions in determining Green Enterpreneurship (GE), either partially with various other factors or its impact on sustainable development. The first focus, as shown in Table 1, examines the potential role of informal institutions in Green Enterpreneurship (GE). The second focus, presented in Table 2, delves into the determinants of factors that influence Green Enterpreneurship (GE). Lastly, Table 3 and Figure 1 provide a deeper understanding of the determinants driving sustainable socio-economic community development. The principal approach in this experimental research consistently considers the local environmental externalities in relation to SGDs. The main research focuses on the exploration of various determinant factors based on local wisdom, primarily reflected in informal institutions at the local community level. The complete results can be found in the various tables presented in this research.

Table 2. Determination values for factors affecting Green Enterpreneurship (GE)

Model	R Multiple	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.906	.821	.817	.112672	.821	185.424	3	121	.000	1.734
2	.898	.806	.801	.117479	.806	167.326	3	121	.000	1.792
3	.896	.803	.798	.118326	.803	164.365	3	121	.000	1.722
4	.890	.791	.786	.121745	.791	153.028	3	121	.000	1.777
5	.892	.795	.790	.120721	.795	156.322	3	121	.000	1.722

Dependent Variable: Green Enterpreneurship (GE)

Source: Processed by the authors

Based on the research results presented in Tables 1 and 3, it is evident that the variable of informal institutions exhibits the most dominant, positive, and significant standardized coefficients in almost all models, with the exception of model 2. This underscores that the role of informal institutions is a key driver in influencing Green Enterpreneurship (GE) and sustainable development. Model 2 stands out as an exception, where the role of informal institutions in Green Enterpreneurship (GE) is slightly smaller than social entrepreneurship, although it remains positive and significant. This phenomenon indicates that the primary and foremost goal of Green Enterpreneurship (GE) is not commercialization but is focused on motivating the spirit of socio-economic solidarity within the community. In the other models, the role of informal institutions remains the most dominant and significantly affects Green Enterpreneurship (GE) and the achievement of SGDs. Qualitative and quantitative research results consistently indicate that the existence of Green Enterpreneurship (GE) is unique and rooted in localized wisdom in Indonesian society, making it challenging to generalize, even though it adheres to its standards. In Table 2, the determinants of various factors affecting Green Enterpreneurship (GE) remain significant.

Based on the research findings presented in Table 3 and Figure 1, it is evident that the role of informal institutions and GE in driving the achievement of SGDs is informal and formal. In Table 3, the role of informal institutions remains the most dominant, significantly, and positively influencing Green Enterpreneurship (GE), as shown in models 6 and 7. This means that the potential of informal institutions and Green Enterpreneurship (GE) can increasingly drive the achievement of SGDs both directly and indirectly. Figure 1 underscores the paramount role of informal institutional potential, both directly and indirectly, in driving the achievement of SDGs. However, qualitative research results reinforce the idea that the role of informal insti-

tutions in this phenomenon tends to be complementary. There is a tendency for informal institutions to act as a substitute because the existing formal institutions are unable to navigate the existing conditions effectively.

Empirically, the effectiveness of informal institutional potential within Indonesian society is influenced by community characteristics such as solidarity, trust, social norms, social capital, and strategic alliances, which are in accordance with the behavioral character of the local community. Therefore, this empirical research supported earlier analysis that suggested informal institutions are often measured in these dimensions (Williamson, 2009; Matos et al., 2023; Adom and Ackom, 2023). This means that the connection between informal institutions and local community wisdom has successfully, peacefully and inclusively supported the achievement of SGDs with local sovereignty (de Soysa and Jütting, 2023). The connection between informal institutions and local regional wisdom potential within Indonesian society has been more flexible and effective in addressing the complexities of issues occurring within the community compared to the role of formal institutions.

Table 3. Results of path analysis models for increasing entrepreneurial opportunities

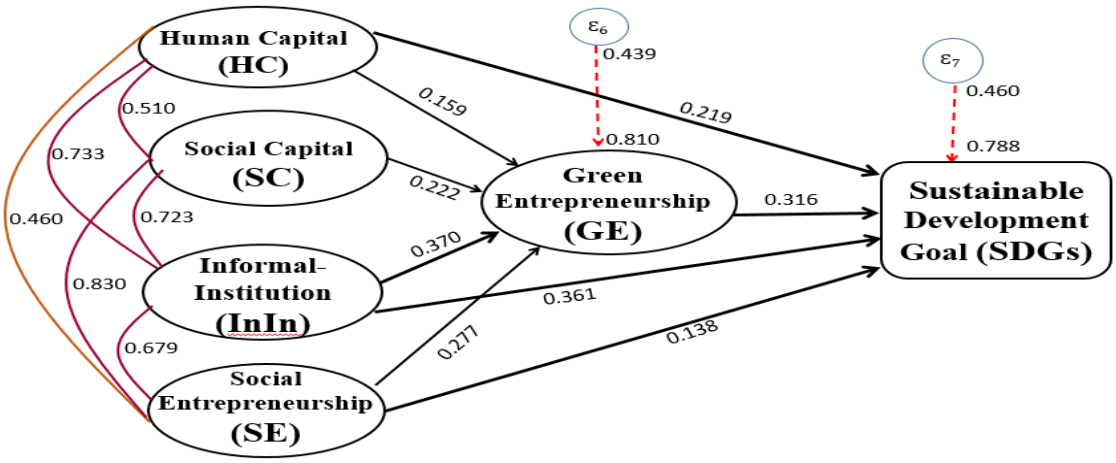
Model	B	Unstandardized Coefficients		Standardized Coefficients	t-stc.	Sig.
		Std. Error	Beta			
6	(Constant)	-.129	.030		-4.357	.000
	Social_Entrepreneur	.301	.079	.277	3.800	.000
	Informal_Institutional	.479	.096	.370	4.978	.000
	Social_Capital	.255	.089	.222	2.870	.005
	Human_Capital	.167	.062	.159	2.710	.008
7	(Constant)	-.131	.030		-4.412	.000
	Social_Entrepreneurship	.143	.059	.138	2.408	.018
	Informal_Institutional	.445	.106	.361	4.200	.000
	Human_Capital	.219	.062	.219	3.530	.001
	Green Enterpreneurship	.283	.054	.316	5.263	.000

Dependent Variable model-6: Green Enterpreneurship (GE)

Dependent Variable model-7: Sustainable Development Goals (SDGs)

Source: Processed by the authors

Figure 1. Path analysis model for increasing Green Enterpreneurship and sustainable development



Source: Processed by the authors

The potential of resource-based connections based on local wisdom strength is increasingly providing outcomes for Green Enterpreneurship (GE) as a mitigation measure for various disturbances within the surrounding community. This means that the local potential based on socio-economic solidarity, trust, and strategic alliances is more capable of exploiting the use of local resources to optimize their potential. Therefore, this research is in accordance with previous examinations, which suggested the increasing importance of the connection between Green Enterpreneurship (GE) and informal institutions (Nikolaou et al., 2018; Alwakid et al., 2021; Lee and Law, 2016). It also confirms the dynamic role of gender in driving sustainable socio-economic development (Prasetyo et al., 2023; Kabir et al., 2023; Godlewska, 2021).

This research indicates that informal institutional potential can fill the capacity gaps of formal institutions that are unable to navigate all the issues within society, practically and theoretically. Empirically, the existence of informal institutions in Indonesia not only acts as a complement and accommodation but can also substitute roles not fulfilled by formal institutions. However, the existing informal institutions are localized and possess unique local wisdom potential that is challenging to generalize globally. It is recommended that they continue to be integrated and collaborate with various national and global resources to drive the achievement of sustainable socio-economic development goals.

Green Enterpreneurship (GE) is a new social innovation used to facilitate sustainable rural economic development. Its emergence is supported by the increasing collective awareness needed to mitigate the impacts of global climate change and economic crises. The potential of this unique form of Green Enterpreneurship (GE) as a basic model and resource for socio-economic solidarity in society will become increasingly important and sovereign in the future. This means that informal institutions are the key drivers of sustainable socio-economic development in Indonesia, and fill the gaps in the new high-quality institutional economics theory. Therefore, this research supports the existing literature that informal institutions are powerful determinants of future economic development (Saleem et al., 2022; Urbano et al., 2021; Williamson, 2009; Minbaeva et al., 2023; Nguyen et al., 2019).

Previous research stated that gender plays a significant role in raising awareness of global climate change (Prasetyo et al., 2023). In addition, the involvement of local intellectual authorities in informal institutions based on local community wisdom is crucial in driving sustainable development achievements. This means that a higher level of community education led to increased collective awareness, particularly regarding Green Enterpreneurship (GE). Therefore, the role of informal institutional potential in Green Enterpreneurship (GE) is increasingly important in driving sustainable development. This is in accordance with previous research that highlighted the importance of informal institutions in the development of entrepreneurial orientation, including Green Enterpreneurship (GE) and sustainable development (Vasilescu et al., 2023; Williams and Bezeredi, 2018).

The specific construction of the role of informal institutional potential is not well integrated. Therefore, this research considered Green Enterpreneurship (GE) as a form of social innovation rooted in local wisdom and its primary goal is to mitigate the impacts of global climate change, while achieving SGDs. The research is limited to the uniqueness and localized nature of Green Enterpreneurship (GE), hence it is challenging to generalize nationally and globally. Another weakness is gender bias, even though, in practice, women are more responsive to these issues, men are often appointed as leaders of informal organizations. These informal institutions are established to influence the consciousness and perspectives of the local community without regard to gender and socio-economic status. Therefore, integration and collaboration with all available resources are crucial for social sustainability because social sustainability is recognized as

a fundamental and integrated component of various activities and facilities within social structure theory (Barbalet, 2022).

5. CONCLUSION

In conclusion, the positive and significant role of informal institutional potential is the most dominant factor influencing Green Enterpreneurship (GE). Informal institutions have continued to play the most significant role in propelling the achievement of SGDs both directly and indirectly. Therefore, the role and function of informal institutional potential is considered the key factor in promoting Green Enterpreneurship (GE) and attaining sustainable socio-economic development goals. One of the methods used to provide insight into the complementary nature of informal and formal institutions in accordance with the pro-green and blue economy development policy strategies of Indonesia is through qualitative research findings. Qualitative research results also emphasized a tendency for informal institutions to serve as accommodative and simultaneously act as substitutes. This occurred when formal institutions were incapable of addressing and navigating the complexities of various issues, including the problem of corruption, which erodes public trust. As gaps in formal institutions worsened due to corruption, the proposition of informal institutional potential as an accommodative and substitutive force became stronger. Green Enterpreneurship (GE) has continued to drive the achievement of SDGs as various informal institutional organizations gained prominence.

Based on collective awareness, the research findings underlined the vital role of Green Enterpreneurship (GE) in mitigating the adverse effects of global climate change and economic crises in Indonesia. Green Enterpreneurship (GE), as a manifestation of social innovation, introduced fresh models of socio-economic solidarity aimed at alleviating various negative impacts. These impacts help to achieve socio-economic development for the sustainable well-being of society when formal and informal institutions work in tandem. The elements of social networks and solidarity, which are integral components of social capital, gain strength and can foster unity and local trust in mitigating these negative impacts.

From an academic perspective, this research provided novel insights into the contribution of informal institutions, which enriched the landscape of new institutional economics theory and rendered it more comprehensive. However, it is limited to the incomplete socio-economic data of communities at the national and global levels in various cases. This research also focused on using fundamental microdata as a measurement dimension for informal institutions based on the uniqueness of local wisdom. The process of generalizing the nature and roles of these institutions on a global scale became challenging since the behavior of each local community possesses unique characteristics that cannot be readily extrapolated to the national or global context. Therefore, future research needs to integrate formal and informal institutions at the national and global levels to provide solutions and navigate the challenges effectively. Integration and collaboration will strengthen the existing institutions because when formal and informal institutions are strong, the resource framework becomes more robust, and conflicts can be minimized.

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Conflicts of Interest & Declaration.

The author is responsible and states; there is no potential conflict of interest of any kind in connection with this research, either before and after its implementation, and/or publication of this article. The authors have declared no competing interests in writing this research article.

Author contributions:

This article is the result of collaborative research, especially those coordinated by the research team listed in this article. All authors participated in the development of the research questions of the study: Conceptualization, Author-1 and Author-3; Methodology, Author-1 and A; data collection Author-1, Author- 2, & Author-3; Validation, Author-1; Data curation, Author-2 & Author-3; Formal analysis, Author-1.; Investigation, Author-3.; Resources, Author-2; Original draft preparation, Author-1; Review and editing,

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CAPABILITY OF HIGHER EDUCATION IN OVERCOMING DIGITAL INEQUALITY IN THE CONDITIONS OF THE CRISIS IN UKRAINE

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ABSTRACT

The purpose of the article is to assess the gap between people's readiness for effective activity in the digital economy and to identify the functional capabilities of universities to reduce this gap. The research used methods of generalizations, logical, systematic, and comparative analysis, and statistical-economic, sociological, and economic-mathematical methods and techniques. The results of the study showed that the digitalization of the economy, the state, and society, which is taking place in Ukraine, requires a significant increase in the level of society's readiness for digital changes. For effective integration into the digital environment, in particular in the field of education, it is necessary to create a digital infrastructure that meets EU standards. The authors conducted a study of the development of the digital inclusive component of the regions of Ukraine.Proposed ways of digital development of society. In particular, it has been proven that promoting the development of the provision of educational services improves the digital literacy of the population for daily tasks and for employers to minimize the gaps between the digital environment and people's skills. It is substantiated that the acquisition of new digital skills and competencies of employees requires the development of training networks and the improvement of foreign language knowledge, both for young people and for other generations.

Keywords: *sustainable development, sustainable development goals, digital inequalities, digital education, Ukraine*

1. INTRODUCTION

The right to education is one of the basic inalienable rights proclaimed by the Universal Declaration of Human Rights. From the point of view of human development, education significantly expands a person's capabilities, as it positively affects various aspects of his life, health, social and political activity, access to knowledge, and the ability to use it both at work and at home - in everyday life, education children, etc. One of the prerequisites for achieving a balanced (sustainable) development of society is science and education, which are also the most important tools for effective management, informed decision-making, and the development of democracy. Education is a particularly striking example of how different populations can come into conflict due to the introduction of new technologies. Recent G20 communiques in 2015 and 2016 made statements about addressing the digital divide, but mainly focused on infrastruc-

ture development, financial inclusion and digital trade. Insufficient attention has been paid to the need to develop digital skills in part due to difficulties in defining and measuring digital literacy. Without digitalization of the economy, that is, without changes in communication channels, training and the labor market, the functioning of the system of medicine and education, public management and administration, making payments, methods of production and sales, various routine operations to ensure life, etc., human freedom is already becoming incomplete. Nowadays, it is difficult to name a sphere of life in Ukraine where changes are not taking place under the influence of digitalization. At the same time, the rates of its introduction in individual sectors of the economy, or in individual regions or settlements, are different. The education system is no exception. Here, too, there are examples of both institutional and territorial unpreparedness of the population for digital changes. Problems arise in terms of the effectiveness of the implementation of measures in work, earnings, all types of activities, self-affirmation, etc.

Among the factors of modern human development, a special place is occupied by the digitalization of social life and the fight against COVID-19. And if the spread of the pandemic is a challenge to humanity, which must be overcome as soon as possible (and armed with the latest medical, biomedical and other knowledge and technologies), then the situation with the development of the IT sphere needs all possible assistance and support. Another program for financing the development of digital infrastructure has been created - Digital Europe Program (DIGITAL), designed for 2021-2027. Its goal is to accelerate the digital transformation of public administration in all European countries, to improve the digital skills of the population. The program provides funding in such areas as supercomputers, artificial intelligence, cyber security, improving digital skills, as well as the widespread use of digital technologies in the economy and public life. However, despite the successes of the EU in the field of digital infrastructure development, the question of its further development remains open. European researchers proposed four scenarios for further development: (1) ultra-liberal, which involves weak controls and negligible data protection, i.e. governments hardly intervene, but market mechanisms are in place; (2) A dystopia where there is strong control but weak data protection; (3) Ultra-social, which includes tight control of infrastructure and reliable data protection, which involves the development of detailed regulation at the legislative level of all aspects of digital infrastructure; (4) A utopia where control over the infrastructure is almost non-existent but data protection is strong, meaning organizations that provide the physical aspect of the digital infrastructure will have almost no government restrictions (EIT Digital, 2022).

2. LITERATURE REVIEW

The authors write that by examining the use of the Internet for learning among students and faculty in higher education, clarity can be gained about how institutional tensions around technology can interfere with their smooth functioning implementation. In this case, faculties are constantly trying to catch up with technology, and students are often dissatisfied or bored with technological possibilities. This situation reinforces the general concern that closing the digital divide alone is not enough (Radovanović et al, 2015). Other authors note that the digital divide is also a literacy and skills divide (Radovanović, 2013; Van Dijk, 2005). (Hincu et al., 2011) believes that the digital divide also persists in settings where information technology penetration is high, highlighting examples where new technologies and tools emerge and the population must improve their skills before they can fully adopt and use the new tools available. The authors (Mićić and Mastilo, 2022) claim that one of the consequences of COVID-19 is the digital transformation of the workplace, which gives advantages to the employee, but only if he has sufficient digital literacy. In particular, the authors claim that modern methods of information

processing using computer technology and the latest software allow for significant expand the monitoring of natural and social processes, which in turn affects the provision and improvement of the sustainable development of the economy (Kuzmak O. et al., 2021). The use of digital tools in the practical activities of public administration bodies contains significant reserves for its optimization but requires the preparation of personnel (Zhuk et al, 2022). Digital skills should also refer to a person's awareness, attitudes, and ability to use digital tools for communication, self-expression, and social action in specific life situations (Goodfellow R, 2011). It is essential that education, including digital literacy, is the basis of future economic growth in the conditions of irreversible demographic decline and the formation of the "knowledge economy" (Pašalić at al, 2020). Another research (Vasyltsiv et al, 2022) substantiates that society's readiness for digital changes creates a favorable environment and ensures the infrastructural development of the modern economy along with other factors (efficiency, involvement, cooperation, etc.).

The European digital agenda primarily aims to stimulate the European economy by ensuring sustainable economic and social benefits from a market perspective. The European Commission distinguishes between basic and transversal skills needed for the modern labor market (European Commission, 2013). Basic skills such as literacy, numeracy, science, and technology are crucial for entering the labor market. Transversal skills include other skills, including linguistic digital skills. Although the European Commission recognizes this skill set as part of cross-skilling, it notes that most jobs require such skills.

Managing digital skills training is critical to attracting infrastructure investment, but this requires accurate, relevant, and representative data that represents the overall reality of digital illiteracy in a way that can be used by policymakers and digital trainers to ensure that such training programs are properly aligned to meet the needs of the rapidly changing labor market, which is accompanied by the demands of digitalization of the developing and growing political economy. Such management should be targeted and based on reasonable assessments concerning the spatial dimension: national or regional. In this context, the question arises about the gradation of territories according to certain quality criteria (in this case, the differentiation of digital inequality) and the target setting, that is, about the classification or typology of regions. Global indices rank countries according to digital development (for example, (E-Participation Index, and E-Government Development Index), and qualitative research conducted in Ukraine evaluates the currently formed digital skills in general (Digital literacy of the population of Ukraine, 2021). Thus, the gap in the methodologies is: (a) insufficient consideration of the regional aspect, especially the depth of differentiation of regions by digital inequality; (b) not taking into account the readiness of the population to acquire digital skills (for example, English language proficiency); (c) the extent of use and the effect of the level of digital skills (employment on digital platforms and the use of these skills in daily activities). The proposed technique, which is based on discriminant and taxonomic analyses, should fill this gap. Discriminant and taxonomic analyzes serve as tools for researching the differentiation of digital inequality of regions and assessing the conformity of deviations of actual (achieved) values of digital equal-

ity indicators from potential or reference values, as well as meeting current needs through the achievement of sufficient levels of digital skills and the possibility of its development.

3. AIM OF THE RESEARCH

The purpose of the research is to assess the depth of the gap between people's readiness for effective activity in the conditions of the digital economy and to identify the functional capabilities of educational institutions to reduce this gap.

4. METHODS

Discriminant analysis refers to object classification methods with "training", that is, with preformed groups. Based on the purpose of the research, the classification problem is formulated as the division of observation objects (regions of Ukraine) into a certain predetermined number of groups (or its refinement in the process of analytical calculations) based on the criterion of distance from the centers of groups (centroids). The analysis results in the assignment of each observation object (region of Ukraine) to only one classification group.

Similar tasks are also solved by cluster analysis. However, its primary purpose is forming new groups and calculating distances from the centroids of groups based on the usually Euclidean distance, which does not consider the relationships between variables. The discriminant analysis aims to identify the difference between classification groups and formulate patterns based on which objects belong to a particular group. At the same time, calculations and classification are based on the Mahalanobis distance, which considers the relationships between data sets. The justification for the choice of discriminant analysis is also based on the possibility of including the semantic category of higher or lower digital inequality (equality) as a grouping feature

The main requirements for the data that will be included in the model for discriminant analysis are:

discriminant variables (variables used to distinguish between groups) should not be functionally dependent or have a close relationship with each other;

discriminant variables must obey the multivariate ordinary distribution law;

the difference between the covariance matrices of the groups should be statistically insignificant (for Fisher's linear discriminant analysis).

All inputs are pre-standardized. The most sharing method of standardization, which provides the most convenient data arrays for further processing and is used when the issue of a standard or norm of indicators does not have an unambiguous interpretation, is a comparison with the standard squared deviation.

Standardization is carried out according to the formula:

$$Z_{ij} = \frac{x_{ij} - \overline{x_j}}{\sigma_j} \quad (1)$$

where $\overline{x_j}$ – is the average value of the *j*-th feature in the data set; σ_j – is the mean squared deviation of the *j*-th feature in the set.

There are three approaches to object classification in discriminant analysis:

based on classification functions: the object belongs to the group for which the value of the function calculated for it is maximum;

based on a posteriori probability: the object belongs to the group for which the probability value of its belonging to it is maximum;

based on the calculation of Mahalanobis distances, the object belongs to the group whose distance to the centroid (center of gravity) is minimal.

Classification functions are linear combinations of discriminant variables that describe the maximization of distinction between groups and the minimization of variance within groups (Blahun et al, 2022). Classification functions have no meaningful interpretation but serve as a tool for assigning a new object to one or another group.

The equation generally describes classification functions:

$$h_k = b_{k0} + b_{k1}x_1 + b_{k2}x_2 + \ldots + b_{km}x_m \quad (k = \overline{1,K}) \tag{2}$$

where h_k – are classification functions for the *k*-th group; b_{ki} – are parameters of the classification equation.

An essential issue in the methods of classification and ranking of statistical populations is the determination of the coordinates of the reference indicator (for discussion see Stepura, 2020). In this context, we rely on taxonomic methods that allow projecting conditional points, taking them as a standard. So, it is advisable to solve the problem by taking the highest values achieved in the regions according to the standardized indicators included in the model as the benchmark for the stimulator indicators and the lowest values for the destimulators (in this research all indicators will be stimulators). As a result, reference points with corresponding coordinates are determined.

An important task that needs to be solved during the quality assessment is its quantitative assessment and finding the optimal values of quality indicators, taking into account the conditions of its formation and use, as well as the degree of deviation of observation objects from the optimal value.

The simplest way to measure the similarity between two objects is the Euclidean distance between two points x_i and x_e, which is determined by the formula:

$$d_{ij} = \sqrt{\sum_{i=1}^{n} (x_{ij} - x_{ej})^2}, \tag{3}$$

where x_{ij} – is the actual value of the *i*-th feature of the *j*-th object ($i=1, \ldots, n$); x_{ej} – is the reference value of the *i*-th characteristic of the *j*-th object. It should be noted that a significant drawback when classifying an array of objects using the Euclidean distance is that it does not take into account the relationships between all objects. The distance between two points is not affected by the position of other points. Therefore, the Mahalanobis distance is used to calculate the position of points in multidimensional space, considering all independent variables and the position of all objects. It is the distance of an object from the centroid in multidimensional space determined by relative independent variables.

Mahalanobis distance takes into account the relationships between the variables in the model that define the multidimensional space and is determined by the formula:

$$d_{ij}^{M} = \sqrt{(X-Y)^{T}S^{-1}(X-Y)} \quad (4)$$

where X, Y – vectors of features; S – covariance matrix of features; T – transposition operation.

Discriminant analysis is based on the calculation of this distance. Therefore, a necessary step for discriminant analysis is the preliminary classification of regions by groups. For this, taxonomic methods are used to divide the range of values of the calculated Euclidean distance into uniform intervals (Table 1).

Table 1. Euclidean distance rating scale

Value d_{ij}	$< (\mu - 2\sigma)$	$\{(\mu - 2\sigma); (\mu - \sigma)\}$	$\{(\mu - \sigma); \mu\}$	$\{\mu; (\mu + \sigma)\}$	$\{(\mu + \sigma); (\mu + 2\sigma)\}$	$> (\mu + 2\sigma)$
Quality assessment of digital inequality	Extremely low	Low	Average	Above average	High	Extremely high

where μ – average value Euclidean distance; σ – standard deviation of the Euclidean distance.

Source: Author's calculation

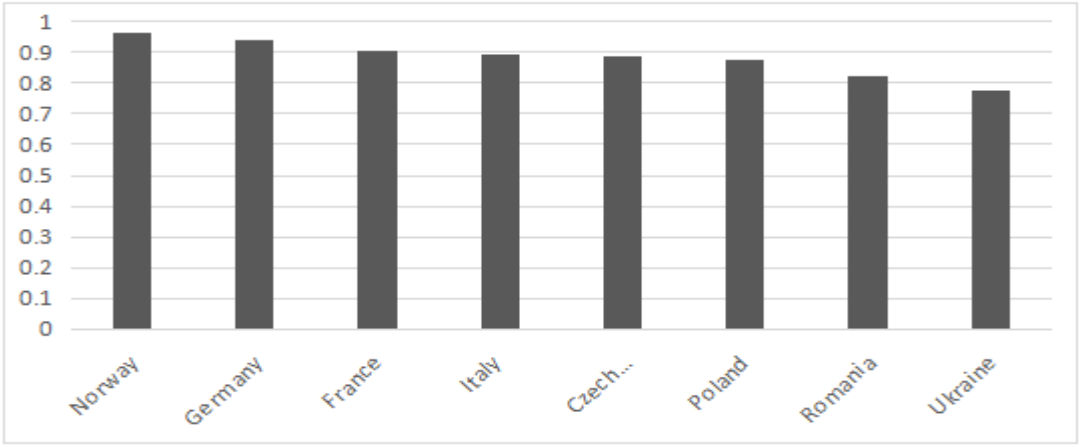
The constructed discriminant model must be checked for adequacy and significance. The criterion of classification quality is the Mahalanobis distance calculated as a result of analytical procedures. Other statistical criteria for the adequacy of the model are the Wilks' statistic (lambda) and the F-criterion, the value of the probability of the error extracting variables from the discrimination procedure.

5. RESULTS

Universities and institutions of higher education in general have long played an important role in the life of cities. They can act as primary mechanisms in society, economy, and environment at local and even international levels. As important platforms for the production of knowledge, research, innovation, and training for the future workforce, these institutions play an important role and impact on society. In practice, modern Ukrainian universities perform socially significant functions. In particular, they participate in the development of national, sectoral, and regional programs for the development of cities and territories, the implementation of modern technologies in various spheres of life, the dissemination of the best global experience and practices, etc. Since the beginning of the war, universities have become centers of volunteerism, and university premises and university campuses have become centers of assistance for internally displaced people fleeing the war. University campuses have become homes for hundreds of families.

The level of education is one of the three components of the human development index (along with GDP per capita and life expectancy). The Human Development Index (HDI), which is presented in three dimensions, which reflect key opportunities in ensuring the entire process of human development, is considered a generalized indicator: to live a long and healthy life (dimension - longevity); acquire, expand and update knowledge (dimension – education); to have access to means of livelihood that ensure a decent standard of living (dimension – the material standard of living).

Figure 3. Human Development Index, 2021



Source: Built on data (EIT Digital, 2022)

The dynamics of the human development index of Ukraine over the years are interesting. As of November 2022, according to the Ministry of Education and Culture of Ukraine, 2,783 educational institutions were damaged by bombings and shelling. 337 of them were destroyed. The share of damaged/destroyed objects was 6.8% of the total number of educational institutions. Of course, it is not surprising that the Human Development Index will decrease in 2022 due to the war because, at the beginning of the war, all educational institutions temporarily stopped working and then switched to online learning mode. Many children were forced to leave their homes and move to other regions of Ukraine that were relatively calm or to other countries. Universities were the most affected:

- Kharkiv region (1 institution destroyed, 19 – damaged);
- Donetsk region (6 – damaged);
- Zaporizhzhia region (4 – destroyed);
- Chernihiv region (3 – damaged);
- Mykolaiv region (3 – damaged).

Classrooms, equipment, sports halls, dormitories, assembly halls, and buildings of educational institutions were destroyed.

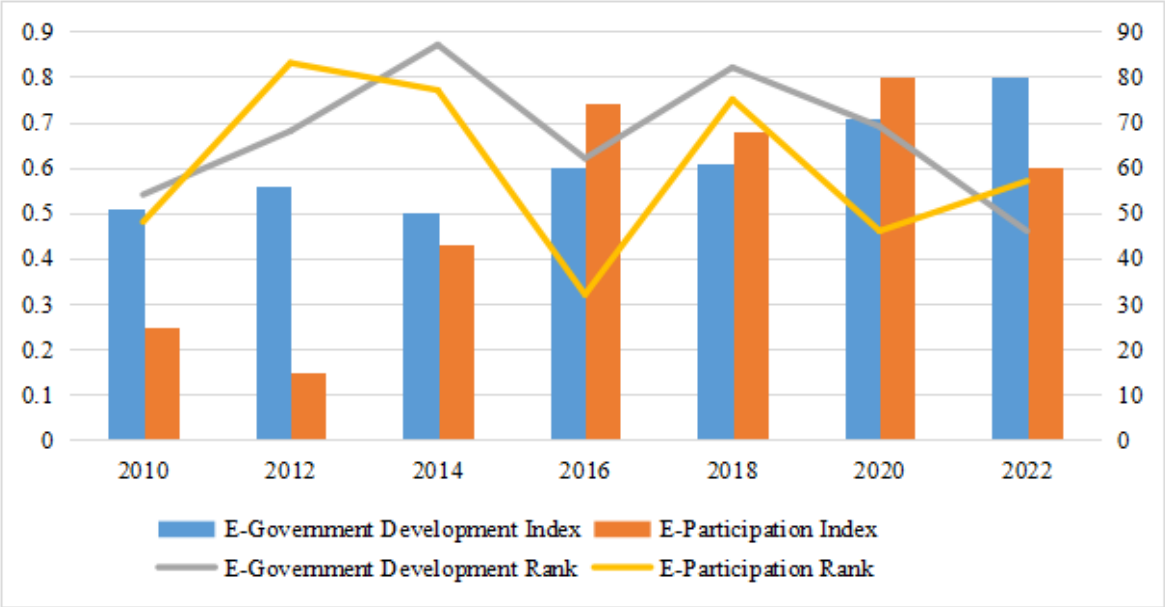
According to the Ministry of Education and Science of Ukraine, during the 10 months of the war, there are 7 million children in the war (Ministry of Education and Science of Ukraine, 2022).

EU members consider education as one of their priorities, so they adopted an action plan to support digital education. The Digital Education Action Plan (2021-2027) was created as a political initiative for EU members, which includes the common goal of high-quality, inclusive, and accessible digital education in all European countries, and it aims to support the adaptation of national education and training systems to the digital age. It includes several areas, such as the creation of a modern common digital infrastructure, the development of the necessary digital skills and competencies to use the aforementioned infrastructure, and the creation of a European Center for Digital Education to strengthen cooperation and exchange best practices in digital education at the EU level (European Commission, 2023). Ukraine's long-term goal is to become a member of the EU. For effective integration into the digital environment, in particular, in the field of education, it is necessary to create a digital infrastructure that meets EU

standards. At this point, several important aspects need to be addressed. First, it is the physical aspect of the infrastructure. Given the state of war in Ukraine, the economic crisis, and the destruction of infrastructure, we will have to change this aspect in the post-war period. Second, it is important to create a regulatory model for the digital infrastructure, including the protection of data and market participants. Thirdly, all the specified measures should be targeted and based on an analytical examination of the depth of the problem of insufficient digital skills and the possibilities of their development and implementation.

In the summer of 2021, the Law of Ukraine "On stimulating the development of the digital economy in Ukraine" (Law of Ukraine) was adopted, which introduced the legal regime of Diya City. The place and achievements of Ukraine in these areas can be evidenced by the data of world ratings. Thus, according to the website (e-Government), Ukraine rose in the ranking of the UN E-Participation Index (from 75th position in 2018 to 46th in 2020), but in 2022 due to war, Ukraine fell again in the rating to 57th position. This index is additional to the E-Government Development Index, in which Ukraine ranked 69th in 2020 (against 82nd in 2018), although in 2022 Ukraine ranked 46th. (Figure 1).

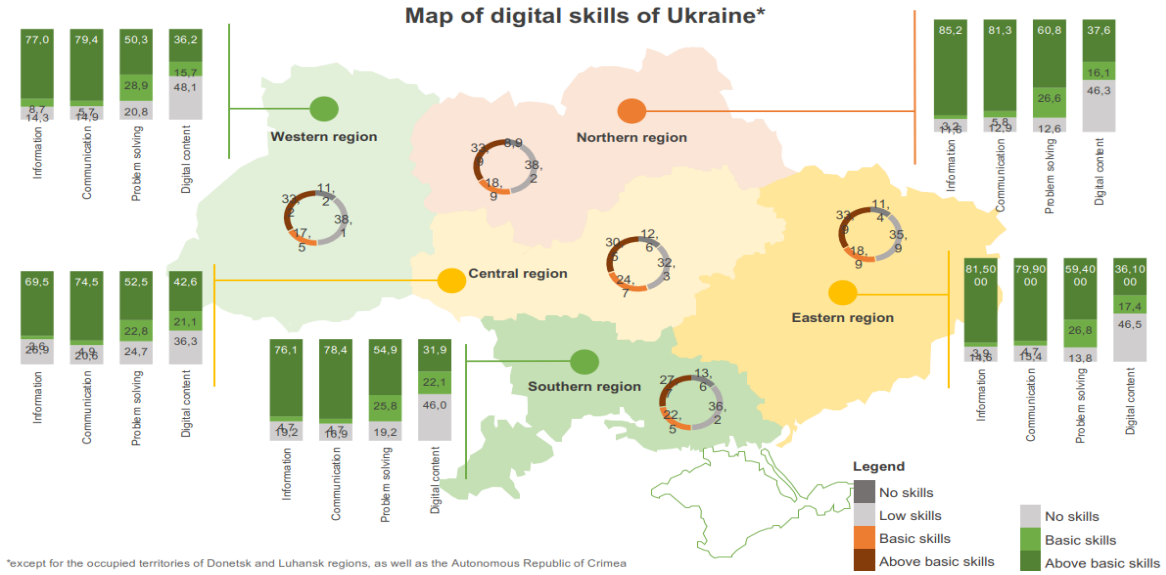
Figure 1. Dynamic of the E-Government Development Index and E-Participation Index, 2008-2022



Source: (UN e-Government Knowledgebase, 2022)

That is, despite the war in Ukraine, according to the E-Government Development Index, Ukraine has risen significantly in the rating, which indicates the effective activity of the government in the field of digitalization. Ukraine has the lowest indicators of the population's skills in using information and communication technologies - both basic and advanced - in Europe. Thus, according to the Ministry of Digital Transformation of Ukraine, the number of the population of Ukraine that does not have digital skills at all in 2021 decreased from 15.1% to 11.2% or 1.09 million people. The share of the population that has basic skills increased from 47.0% to 52.2% (Digital Literacy of the Population of Ukraine, 2021). To understand the level of complexity of these skills: basic involves writing an email, and standard involves creating an electronic presentation.

Figure 2. Digital skills map of Ukraine, 2021



Source: (Digital literacy of the population of Ukraine, Ministry of Digital Transformation, 2021)

At the same time, 31% of the population of Ukraine is concerned that their digital skills are not good enough. 44.4% of Ukrainians aged 18-70 are interested in improving their digital skills. From the above, we conclude that Ukraine is undergoing a stage of rapid adaptation to the mass introduction and spread of digital technologies in society and the economy: among the population, businesses, and government officials. Digital development in Ukraine is gaining momentum. At the same time, there is a gap between its capabilities and access to it, that is, a dysfunction of human needs and the ability of the environment to satisfy them.

Eight indicators were selected for each of Ukraine's regions using the above-described methodology to study the digital inequality of Ukraine's regions. The input indicators are given in Table 2; their actual values are in Table 3. Since such statistics are not collected regularly, dynamic generalizations were excluded - the indicators were formed as possible, so the year is displayed in the table with input indicators (Tables 2 and Table 3). For meaningful interpretation, they are grouped into signs of the development of digital inequality. At the same time, all indicators were stimulants.

Table 2. Input indicators for the study of digital inequality in the regions of Ukraine

Feature	Indicators	Year of indicators forming
Digital skills and possibilities of their formation	digital skills (the level of possession of digital skills at the level of "average" and above), % of respondents in the survey (x_1);	2021
	the average score of the final exam for the matriculation certificate in English (x_6);	average for 2018-2019
Employment in IT sphere	the number of individuals - entrepreneurs for the provision of IT services, per 1000 people of the population[a] (x_2);	2020
	median salary level of IT specialists, $ per month (x_5);	2020
Employment on digital platforms	distribution of digital platform workers by region of residence, % (x_4);	2017
Ability to solve everyday problems through digital platforms	distribution of Monobank cardholders by region[b], % (x_3);	2019
Availability of digital networks	share of households with access to Internet services at home, % (x_7); the volume of implemented services to the population in the field of telecommunications and postal communication, in actual prices including VAT; UAH (national currency) per person of permanent population (x_8)	average for 2018-2019

[a] most specialists working in IT in Ukraine are registered individuals – entrepreneurs.

[b] Monobank – a fully digital Ukrainian bank.

Source: concluded by the authors on the basis of (SSSU; Rating of DOU cities, 2021; ILO, 2018; MDT, 2021; UCEQA, 2020; Monobank, 2019)

Table 3. Actual values of input indicators for the study of digital inequality in the regions of Ukraine.

Region	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8
Vinnytsia region	47,9	2,21	3,1	1,9	1340	155,4	59,75	420,99
Volyn region	52,2	1,13	1,9	0,7	1000	146,3	51,30	449,79
Dnipropetrovsk region	47,2	3,24	11,8	9,2	1500	149,0	78,60	444,59
Donetsk region	47,2	0,64	4,0	2,3	1000	144,8	60,80	454,93
Zhytomyr region	52,1	1,81	1,9	1,3	1400	141,5	46,30	444,65
Zakarpattia region	52,2	0,90	1,9	0,5	1500	144,3	73,30	440,96
Zaporizhzhia region	47,2	2,33	5,0	4,2	1050	146,0	66,25	542,38
Ivano-Frankivsk region	52,2	1,45	1,9	1,4	1400	144,5	59,15	415,33
Kiev region	52,1	7,86	6,1	6,0	2300	150,5	57,50	414,49
Kirovohrad region	47,9	1,26	1,9	1,0	1120	146,0	52,20	460,49
Lugansk region	47,2	0,56	1,9	0,9	1000	145,7	60,85	393,34
Lviv region	52,2	4,95	6,7	6,1	1825	140,0	65,80	456,90
Mykolaiv region	36,0	3,35	1,9	1,5	1200	151,9	63,05	582,36

Odessa region	36,0	2,44	6,5	5,4	1500	142,4	66,50	834,06
Poltava region	47,9	1,57	3,1	3,1	1300	145,0	55,40	593,16
Rivne region	52,2	1,29	1,9	1,7	1387	146,6	58,40	385,87
Sumy region	52,1	1,53	1,9	1,7	960	147,8	65,00	528,46
Ternopil region	52,2	1,22	1,9	0,6	1000	145,8	61,90	461,58
Kharkiv region	47,2	6,35	7,8	7,6	1600	150,0	64,10	597,03
Kherson region	36,0	1,47	1,9	1,9	1140	148,1	52,00	599,07
Khmelnytsky region	52,2	1,36	1,9	2,2	1100	142,9	50,40	353,46
Cherkasy region	47,9	2,22	1,9	2,2	1150	145,9	54,10	465,95
Chernivtsi region	52,2	1,31	1,9	0,6	1275	147,1	71,60	470,62
Chernihiv region	52,1	1,92	1,9	2,5	1100	149,7	55,25	626,32

Source: concluded by the authors on the basis of (SSSU; Rating of DOU cities, 2021; ILO, 2018; MDT, 2021; UCEQA, 2020; Monobank, 2019)

Some notes to indicators. The indicator of digital skills is obtained from a survey conducted by the Ministry of Digital Transformation in 2021 according to the methodology of the European Commission for calculating the Digital economy and society index, which includes, in particular, the indicator of the level of possession of digital skills (basic, above basic, basic software skills) by the population (MDT, 2021). The latter is formed based on the premise that the respondents during the last three months carried out a specific activity on the Internet, which refers to their performance of informational (working with files, data), communication (messaging, using social networks, correspondence, calls on the Internet) functions, problem-solving skills (online banking, online learning, online shopping, etc.) and software skills (using programs, writing them, etc.). In this context, the content of the indicator of Monobank cardholders (x_3) precisely reflects the level of formation of problem-solving skills through digital platforms.

The average score from the final exams for the matriculation certificate English language test was entered into the data set because, according to focus group surveys and in-depth interviews conducted within the scope of the study (ILO, 2018), most often among all, including Ukrainian, English is the primary working language in employment on digital platforms. Therefore, having it is necessary for success in the digital sphere. The data source is the website of the Ukrainian Center for Educational Quality Assessment (UCEQA, 2020).

The median salary level of IT specialists is obtained from a survey conducted by the DOU platform (Rating of DOU cities, 2021). It refers to wages in regional centers, which form the most employment in this field by region.

Employment on digital platforms is freelance, mainly, related to work with texts, programming, and creating and maintaining sites. The data are obtained from a survey conducted by the Kyiv International Institute of Sociology on behalf of the International Labour Office in the second half of 2017 (ILO, 2018).

The results of the calculations carried out in the application package of the Statistica program are presented in Table 4. Classification accuracy in all groups is 100, and Wilks's lambda is 0.02195 (the smaller the value, the higher the resolution of the discriminant function). Visualization and generalization of the classification are presented in Table 4 and Figures 4 and 5. Classification groups of regions with lower inequality are in a better position. The map visualizes in a darker color those regions with a low level of digital literacy and inclusion of the population in digital activities.

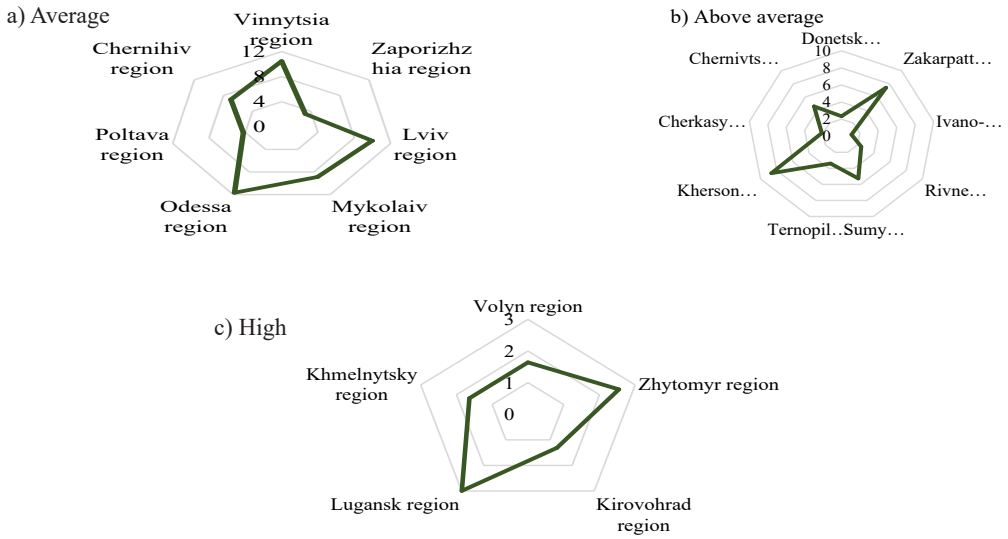
Table 4. Classification of regions of Ukraine according to digital inequality

Classification groups	Region
Extremely low	Kharkiv region
Low	Dnipropetrovsk region, Kiev region
Average	Vinnytsia region, Zaporizhzhia region, Lviv region, Mykolaiv region, Odessa region, Poltava region, Chernihiv region
Above average	Donetsk region, Ivano-Frankivsk region, Zakarpattia region, Rivne region, Sumy region, Ternopil region, Kherson region, Cherkasy region, Chernivtsi region
High	Volyn region, Zhytomyr region, Kirovohrad region, Lugansk region, Khmelnytsky region

Source: summarized by the authors based on their own calculations.

The results of the analysis are remarkable. By a significant margin, the Kharkiv region fell into the group with an extremely low level. The group with a low level was also represented by Kyiv and Dnipropetrovsk regions. The question arises about the Lviv region, in which IT and digital literacy development is one of the highest in Ukraine and which, according to the results, entered the group with an average level. The answer to this lies in the indicators that made the most significant contribution to the differentiation of groups: (a) employment on digital platforms (*F-remove* = 24.6); (b) the results of the English language test (16.75); (c) the salary of IT workers (4.28); (d) volume of telecommunication services per 1 inhabitant of the region (3.12), equipment of households with Internet access (1.39). Furthermore, if all other indicators (the number of individuals - entrepreneurs in the field of IT - third place in Ukraine after Kyiv and Kharkiv, wages in the IT sector - second after Kyiv) in Lviv region is at a very high level, then the quality of knowledge of the English language - on the last one, which pushed it into the middle group in the classification of regions by the level of digital inequality.

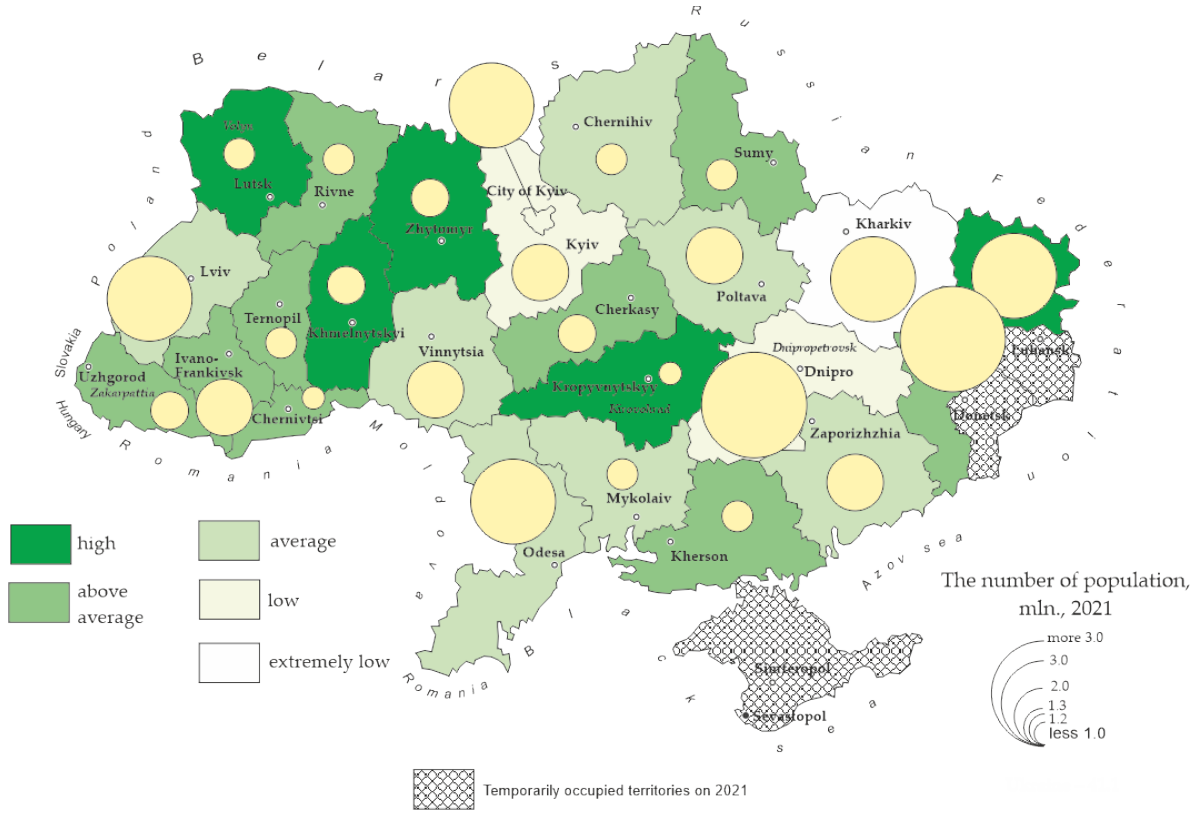
Figure 4. Discriminative groups and Mehalanobis distances from the centroids of groups of regions of Ukraine according to digital inequality:
a) Average; b) Above average; c) High



Source: built by the authors based on their own calculations

It should also be noted that employment on digital platforms, which made the most significant contribution to the differentiation of groups, has the highest value in the Dnipropetrovsk and Kharkiv regions and is not limited to programming (only 12% in the total structure) – it is a wide range of services for works with texts (including the work of bots, the execution of various orders that are not entirely in the sphere of legitimacy), as well as the development of sites. Therefore, the Lviv region is among the pioneers, but only in some digital work and literacy sectors. It should be noted that most indicators of digital literacy (information, communication, problem-solving skills), according to the survey of the Ministry of Digital Transformation (MDT, 2021), are higher in the southern regions of Ukraine.

Figure 5. Cartographic reproduction of the digital inequality differentiation in the regions of Ukraine



Source: visualized by the authors based on their own calculations

Only programming skills are above average in the Western region. Such conclusions testify in favor of the fact that in the formation of educational policy, these patterns should be taken into account, and the specifics of work on digital platforms should be distinguished. Varieties within this type of employment are significant in all respects: legitimization, the complexity of work, and, accordingly, the required level of training, duration of working hours, and earnings. For example, if the median salary of an IT specialist in the Lviv region is $1,825 in 2020 (Rating of DOU cities, 2021), then income is often a part-time job on digital platforms. Earnings for primary employment are, on average, $120 per week and $500 per month (at the rate of the National Bank of Ukraine), and as part-time jobs – $50 and $200, respectively (ILO, 2018).

6. CONCLUSIONS

Therefore, taking into account that the digital world is rapidly penetrating all spheres of life, that is, the processes of digitalization of the economy of Ukraine are objective and irreversible, and the fundamental principles of educational policy for the development of digital literacy and overcoming digital gaps should become:

1) Promoting the development and provision of educational services to increase the digital literacy of the population for daily tasks and employment to minimize the gaps between the digital environment and the skills of people, especially those who are more difficult to adapt.

2) Development of networks for learning and improving knowledge of a foreign language, both for young people and for other generations, taking into account the specifics of age and the necessary level of mastery for comfortable inclusion in digital reality.

3) Promotion of the development of all types of employment on digital platforms within the limits of legality in the context of future transformations of types of employment.

4) Taking into account the aspects of the differentiation of the regions of Ukraine by digital inequality to overcome it.

In performing the first two tasks, informal education operators can play an important role, since state institutions are not sufficiently mobile. When developing policy measures, it should be taken into account that digital reality, as a completely new sphere of life, contains risks: information risks, risks of loss of employment, and security risks. Another useful way to improve the digitalization of education is to involve as many students as possible, as well as teachers, in the online learning process on open online courses providers such as Coursera and Udemy, which collaborate with universities and other organizations and offer online courses, certificates and degrees in various subjects. Both online learning platforms have many advantages, including the fact that the courses are vetted and offered by prestigious universities, meaning they already have academic value.

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DEMOGRAPHICS' IMPACT ON ECONOMIC GROWTH IN CENTRAL EUROPE AND THE BALTIC STATES

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ABSTRACT

To ensure sustainable development and public welfare, the complex impact of demographic factors on macroeconomic dynamics should be investigated properly. Moreover, a few of the Sustainable Development Goals are interconnected robustly with demographic issues. There are some trends (e.g., substantial increase in longevity, rapidly lowered fertility, etc.) common for most advanced and emerging market economies. We examined the impact of selected socio-demographic factors on the real GDP per capita growth rates in a sample of the Baltic states and the Central European countries that have experienced economic transformations in the 1990s and either entered or declared their intentions to join the European Union in the future. We investigated general demographic dynamics in the region from 1960 to 2021. Due to the data availability, our special attention was focused primarily on the highlighted countries' socio-demographic and macroeconomic variables from 2000 to 2021. We suggested that there was a certain interdependence between the working age population stratum specific weight, the elderly demographic dependency ratio, public healthcare spending, gross capital formation, and the real GDP per capita growth rates. In addition, we propose the main priorities for social and demographic policy in the field of well-being improvement. The potential ways to enhance the model – regarding healthcare, education, and the general profile of fiscal policy – have been disclosed as well.

Keywords: *population structure, demographic ageing, human capital, public welfare, social and fiscal policy mix, economic growth, sustainable economic development*

1. INTRODUCTION

The economic growth issues form the core of modern scientific discourse in a plethora of social studies. The methods applied to achieve the aforementioned phenomenon vary significantly depending on the conceptual bases of the particular scholars' theory or the implemented economic policy's profile. To ensure sustainable development and public welfare, national governments and other public institutions should conduct prudent, growth-friendly, and consistent policy (Arslan, & Kekeç, 2023; Kuzmak, & Kuzmak, 2023; Oliinyk, 2023). Meanwhile, the self-confident economic agents' activities should be considered and judicious in addition. Therefore, the country's welfare level derives from both the complex measures provided by public authorities

and the respective agents' self-organization. Disregarding the ideological component, human recourses are considered traditionally as an essential economic development factor (Kuzu & Arslan, 2023). While the population inherently possesses the power to induce intellectual capital, the ways to accelerate the respective positive dynamics in advanced and emerging market economies are rather incomparable. Permanent shifts in the age structure of the population determine the peculiarities of public spending and final consumption (Vladymyr, 2023). An increased life expectancy at birth and low fertility form the common trend for most European economies, forcing respective authorities constantly reshape their social, demographic, and fiscal policy mix. In this study, we evaluated multi-level interdependencies between the population structure fluctuations and both direct and indirect investment in intellectual and physical capital, taking the concept of demographic sustainability into account. Moreover, considering the Wicksell / Cobb–Douglas function, we investigated mutual connections between investment dynamics in physical and intellectual capital. National governments should counteract the critical inequality and simultaneously soften the undesirable effects of macroeconomic cyclicality. Meanwhile, the excessive social protection might have unacceptable consequences for the national economies. Moreover, full-scaled paternalism slows economic development, reducing the respective agents' activity. It is necessary to find the exact socio-demographic and fiscal policy mix that could be synchronously growth-friendly and acceptable for different economic agents. In that 'ideal' model, the economically active agents ensure their own well-being, while public welfare depends on both government decisions and the complex of individual activities in addition.

2. LITERATURE REVIEW

Ahmad & Khan (2018) disclosed the interrelation between demographic transition, human capital accumulation and economic dynamics in 67 emerging markets, using 5-year interval data over 1960–2014. The authors pointed out that an essential increase in the labor force participation rate contributed to the investigated dynamics positively. The prerequisites needed to get the demographic transition's benefits were determined as: a) adaptive labor markets (capable to absorb different population strata); and b) sustainable investment in human capital. Meantime, special attention should be paid to the intellectual component of human capital formation. Using data for 132 countries from 1996 to 2011, Ali, Egbetokun, & Memon (2018) revisited the main human capital-related hypothesis and presented new results on a set of conditions under which the aforementioned phenomenon has been robustly and positively associated with economic development. The authors proved that economic opportunities reinforced the human capital impact on growth. Under a neoliberal economic doctrine, Lazutka, Juška, & Navickė (2018) examined the split of national income between labor and capital in Lithuania, considering its distributional implications and ongoing demographic crisis in the Baltic states. The authors proved that Lithuanian rapid economic growth phenomenon has been based on artificially suppressed wages, lowered taxes on capital and 'cheap' labor export to the core EU member-countries. Those facts contributed to socially corrosive high economic inequality and large-scale emigration as well. Thus, aiming to optimize public welfare, the government's human capital growth-friendly policy should be applied. Ogundari & Awokuse (2018) observed two alternative measures of human capital – investment in health and education – considering their effects on economic growth separately. Investment in the healthcare system positively contributed to economic development, while its overall effect appeared to be slightly larger than investment's in the education one. That fact could be explained by rather insufficient institutional development of the region under study (Sub-Saharan Africa).

Lutz et al. (2019) assessed the significance of changing age structure and increase in human capital for economic growth for a panel of 165 countries over 1980–2015. They determined that the education's quality has been the main trigger for economic development, while investment in human capital could accelerate macroeconomic dynamics crucially. Hallett, Hougaard Jensen, Sveinsson, & Vieira (2019) investigated the features of fiscal policies applied in the OECD countries considering the particular financial rules aimed at maximizing economic growth under changing demographics. Public and private capital was identified as the labor productivity-enhancing factor. Moreover, properly handled demographic changes (e.g., prudent policy dealing with the population ageing) should not be necessarily considered as a conventional problem, in case if reliable fiscal rules and credible restraints were set up in advance. Regarding demographic and technological changes' macroeconomic implications, Jimeno (2019) proposed a new design for a growth-friendly fiscal policy. Meanwhile, due to the above model, an increase in productivity was associated with the risk of disruptive effects on employment and wages. Sanderson & Scherbov (2019) provided a new way to measure individual and population ageing. They proposed 'prospective age' concept, which should be regarded while preparing the respective social and financial policy mix. Yoshino, Kim, & Sirivunnabood (2019), investigated the ageing's impacts on fiscal sustainability in the Group of 20 from the 1950s up to the present time and proposed the demographic forecast for the subsequent three decades. Due to enormous and multi-faceted population ageing effects on public production (e.g., fiscal balances deteriorations, destructive changes in the patterns of saving and investment, shortages in the labor supply, and imperfect welfare systems in emerging market economies in addition), a possible decline in economic growth as well as the ineffectiveness of macroeconomic policy has been predicted. Investigating the data of 143 economies with 14 publicly available indicators, Baser & Gokten (2019) pointed out the new paths of economic growth, taking the mediating role of human intellectual capital into account. The scholars focused on the institutional quality phenomenon that determined the decisions for starting or supporting the development processes. Diebolt & Hippe (2019) highlighted the human capital's long-run impact on innovation and economic development regional disparities in Europe. The scientists proved that both central and local policy makers should prepare human capital strategy appropriately and adapt it to the regional peculiarities to boost economic development. Using the time series techniques for 1971–2013 in Spain, Marquez-Ramos & Mourelle (2019) disclosed the existence of nonlinearities in the interrelation between education (both secondary and tertiary) and economic growth at the country level. While preparing the programs for economic development, a government should consider the above nonlinearities. Introducing a new dataset measuring learning peculiarities in 164 countries and territories from 2000 to 2017, Angrist, Djankov, Goldberg, & Patrinos (2019) investigated the relationships between 'schooling' and 'learning' and the subsequent gap in human capital formation, taking the concept of sustainable development into account. The authors demonstrated that human capital had been accounted for up to a third of cross-country income differences.

Considering a sample of Asian countries, Aslam (2020) argued that human capital alone might not be a significant contributor to economic growth. Moreover, the high-quality institutional architectonics of public governance could provide all the necessary conditions to amplify the human capital's influence on the development processes. Terták & Kovács (2020) explored the changes that have occurred in the relations between economic agents and – on a broader scale – in public governance over the short-run as a response to the global COVID–19 pandemic. The authors pointed out that the banking system, apart from providing its traditional services, also has had to act in both complex and adaptable roles, indispensable for the maintenance and strengthening of social cohesion. Regarding the concept of an Empty Planet, Jones (2020)

examined how increased longevity and declined fertility have affected growth simultaneously in advanced and emerging market economies. Collin & Weil (2020) examined the income and poverty dynamic responses to induced investment in human capital of the new workers cohorts, using a quantitative macroeconomic model with realistic demography. The higher human capital impact on fertility and the follow-on effects on income have been investigated as well. The authors found out that investment in human intellectual capital was more cost-effective than investment in physical one as a means to achieve specified income or poverty goals.

In the series of studies (Kozlovskyi, Pasichnyi, Lavrov, Ivaniuta, & Nepytaliuk, 2020; Pasichnyi & Nepytaliuk, 2021) a concept of demographic sustainability has been proposed in order to achieve optimal parameters of public governance and sustainable development. Wijaya, Kasuma, & Darma (2021) highlighted the effects of demographic pressure, happiness, and a human development index on labor force and economic growth in Romania over the 2013–2019 period. A significant positive impact of a human development index on economic growth through the labor force has been proved statistically. Ding, Huang, Gao, & Min (2021) investigated panel data of 143 countries and regions over the 1990–2014 period, proving that the output elasticity concerning human capital has been greater compared to the physical one, while green GDP has been remarkably more sensitive to the shifts in human capital than the 'traditional' GDP. Zapata-Cantu & González (2021) highlighted the significance of institutions and human capital, regarding the challenges for innovation and sustainable development in Latin America, and proposed a roadmap for emerging markets basing on dynamic capabilities and mission-oriented policies. He & Yao (2022) employed panel data from 30 Chinese provinces from 2008 to 2019 and utilized the spatial Durbin model and quantile regression model to examine the interrelation between a business environment, human capital structure upgrading, and economic development quality. The authors proved that human capital compositional amelioration played a crucial intermediary role, through which improvement in the business environment affected economic growth. Marszowski & Lejwoda (2022) argued whether demographic changes and automation have threatened the labor market's development. They pointed out that the mental barriers to the above phenomena should be broken to strengthen their acceptance and accelerate the growth processes. Meanwhile, considering the sample of 181 economies, Ishfaq, Ghani, & Ngo-Hoang (2022) studied the effects of human capital accumulation and it's influencing variables (e.g., expenditure on education and quality of education, labor force, free trade, and investment) on economic growth and proved that all the investigated indicators have had a positive impact.

Billari (2022) compared the 'slow' demography with the 'fast' one in order to adjust demographic forecasts. Considering constantly rising longevity, Albertini, Tur-Sinai, Lewin-Epstein, & Silverstein (2022) investigated the phenomenon of sandwich generations and gave special attention to the differences between welfare and transfer regimes. Taking the concept of the Sustainable Development Goals into account, Niaz (2022) pointed out a roadmap from vulnerability to sustainability through financial inclusion and proved that individual socio-economic status and its development have been dependent on demographic factors. Duszczyk & Kaczmarczyk (2022) profoundly examined the challenges associated with war in Ukraine and migration to Poland and their complex impact on the structure of population. Kiniorska, Brambert, Kamińska, & Kopacz-Wyrwał (2023) disclosed demographic ageing in Europe during the period of 2008–2021 and presented a new typological approach to the areas of unbalanced age structure. They concluded that most of the countries under study have already reached the stage of 'very old' population in the 1990s. Regarding demographic change, Devriendt, Heylen, & Jacobs (2023) evaluated alternative options for the reforms in the public pension system in an

overlapping generations' model for an open economy. The scholars argued that a reform combining an increase in the retirement age with an intelligent linkage between the pension benefit and the earlier labor earnings could be the best choice for the aged societies. Sulisnaningrum, Widarni, & Bawono (2022) applied vector analysis to investigate causality relationship between human capital, technical advancement, and economic growth in Indonesia from 1995 to 2020. According to the aforementioned scholars, human capital and technology were reinforcing each other mutually because of progress processes; economic growth should be bolstered by monetary expansion to foster innovation.

The demographic factors' effect on economic development has been the subject on numerous studies. However, the regional and institutional peculiarities of macroeconomic and sociodemographic dynamics interrelation in Central Europe and the Baltic states requires additional investigation.

The purpose of this article is to evaluate the demographic factors' impact on the economic growth dynamics and to propose the main priorities for the social and demographic policy mix in the field of well-being improvement.

3. METHODS AND DATA

The theoretical and methodological bases of this study were the scientific works addressing the issues of the socio-demographic and fiscal policy mix compositional structure and the features of population dynamics in advanced and emerging market economies.

We used the statistics of the World Bank open database. Taking the inertia of demographic changes and the data availability into account, we investigated the time interval from 1960 to 2021. The sample represented the Baltic states and the Central European countries that have experienced radical economic transformations in the 1990s and later joined the European Union (hereinafter – EU) or declared their course for entering it. The sample included Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Moldova, Poland, Romania, Slovakia, Slovenia, and Ukraine. For the period from 1960 to 1992, we analyzed the population dynamics and macroeconomic indicators of the respective republics of the Union of Soviet Socialist Republics (hereinafter – USSR), the Czechoslovak Socialist Republic (from 1990 to1992 – the Czech and Slovak Federative Republic), and the Federal People's Republic of Yugoslavia (from 1963 to 1992 – the Socialist Federal Republic of Yugoslavia). The population aged 15 to 64 was identified as economically active. The working possibilities for the persons aged 65 and older has been noted.

We used the theoretical generalization to systematize the factors influencing the socio-demographic and economic development of the sampled countries. We applied the methods of statistical analysis (grouping, study of dynamic series, and stochastic modeling, etc.) to investigate the population dynamics' peculiarities.

We made a methodological assumption that certain architectonics of public administration rationally combined with the economic agents' self-organization could ensure sustainability, optimal demographic and income dependency ratios. While studying the factors' impact on economic growth, we considered the concept of demographic sustainability. It could be partially described by *the model (1)*. We disclosed general changes in the population age composition of the sampled countries and analyzed the respective dynamics in terms of working age and non-working age strata. The main attention has been paid to an increase in the elderly population age stratum and to the government policy measures aimed to optimize both social and

economic consequences of the aforementioned phenomenon.

$$\begin{cases} \frac{IAP}{EAP} = Ddr \rightarrow opt\,(min); \\ \frac{AIEpc}{AIpc} = Idr \rightarrow opt\,(min); \end{cases} \quad (1)$$

where Ddr – demographic dependency ratio;

IAP – economically inactive population;

EAP – economically active population;

Idr – income dependency ratio;

AIEpc – average amount of per capita income spent on economically inactive population;

AIpc – average per capita income.

The initial hypothesis of the study was that the real GDP per capita annual growth rate (GDPpc_gr) has been stochastically interrelated with: a) working age population's share as a percentage of total population (WAP); b) the elderly demographic dependency ratio (EDdr); and c) domestic general government healthcare expenditures as a percentage of GDP (GHE). We imposed a control – gross capital formation (GCF) as a percentage of GDP. Consisting of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories, GCF combined all kind of investments in physical capital. Hence, we have built *the next stochastic model (2)*:

$$GDPpc\_gr = A + \alpha1 \times WAP + \alpha2 \times EDdr + \alpha3 \times GHE + \alpha4 \times GCF + \varepsilon, \quad (2)$$

where A – a constant;

α1, α2, α3, α4 – respective regression coefficients;

ε – statistical error.

Obtained and verified stochastic interdependence could be used to prepare the socio-demographic and macroeconomic policy mix.

4. RESULTS

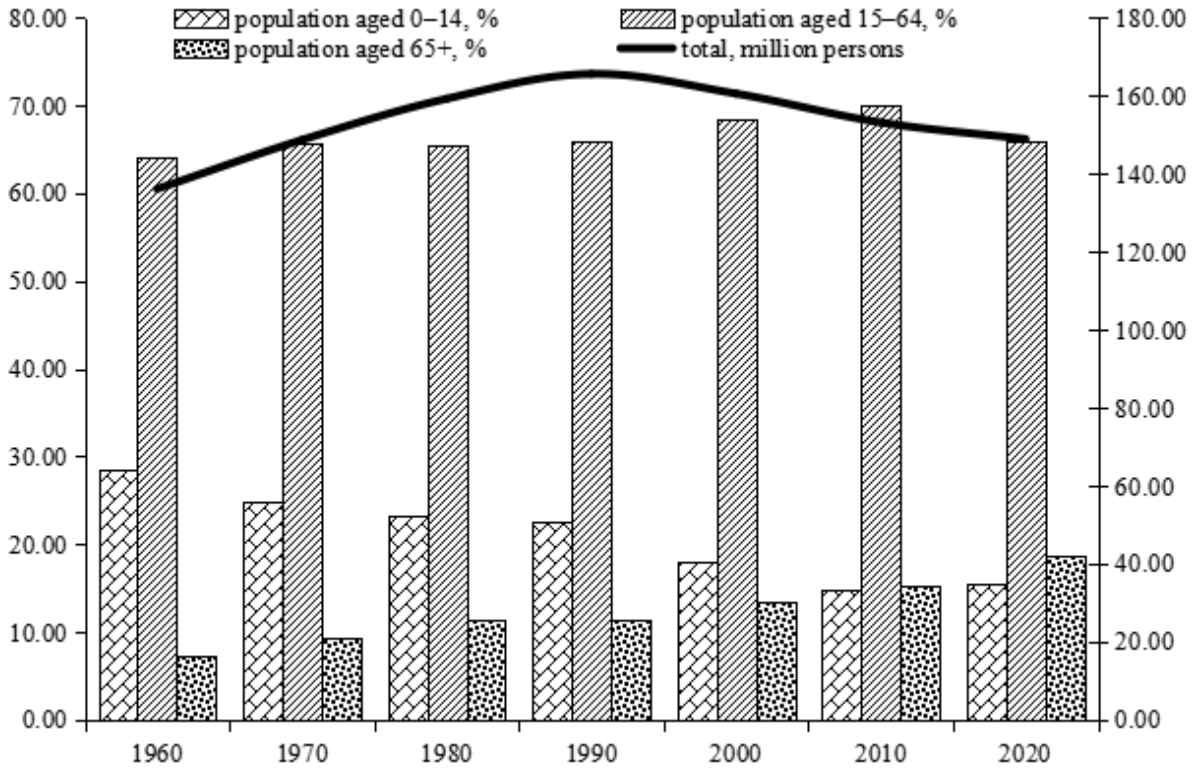
4. 1. SOCIAL AND DEMOGRAPHIC DYNAMICS IN CENTRAL EUROPE AND THE BALTIC STATES IN 1960–2021: AN EXPERIENCE OF COMPARATIVE ANALYSIS

From 2015, the United Nations established 17 Sustainable Development Goals (hereinafter – SDGs) aimed to maintain international peace and security, to set friendly relations among the nations, to achieve international co-operation, and to serve as a harmonizing center for the nations' actions. Several of the SDGs are directly (SDG 1–SDG 5) or indirectly (SDG 8, SDG 10, SDG 16–17) interconnected with demographics. To counteract poverty efficiently as well as to ensure zero hunger, good health and well-being, high quality of education, and gender equality, the specific public regulation measures should be undertaken (Moraliyska, 2023). Prudent social and demographic policy mix could ensure decent work and economic growth, reducing the inequalities simultaneously. In this study, we consider the SDGs as an undertaken public poli-

cy's strategic markers. To investigate demographic dynamics of the sampled countries properly, we split the entire time interval under study in two sub-intervals: a) from 1960 to 1990; and b) from 1991 to 2020. During the first sub-interval, all the sampled economies belonged to the so-called 'socialist camp' under conditions of the aggravation and finalization of the first Cold War. Thus, the dominant ideology and centralized processes of public production determined most aspects of their social, economic, and even demographic ontology. Resource-oriented type of the USSR development model affected demographic dynamics as well.

The total population of the countries under study increased by 1.22 times from 136.11 million in 1960 to 165.60 million in 1990 (Fig. 1). In 2020, the sampled countries population equaled to 148.92 million. In 2021, the population of the countries under study decreased rapidly and equaled to 148.06 million. That fact could be due to the global COVID–19 pandemic. The share of the working age stratum in the structure grew slightly up (by 1.73 percentage points) from 64.21% in 1960 to 65.94% in 2020. The above dynamics corresponded with a reduction (equaled to 13.13 percentage points) in the specific weight of the youngest population stratum from 28.61% at the beginning of the period to 15.48% at its end. Over the entire period, gradually declining fertility formed a general trend for the advanced economies. Regarding that fact, an essential increase in life expectancy at birth has been observed. Automatically, the specific weight of the elderly population age stratum in the total structure raised from 7.17% in 1960 to 11.31% in 1990 (with an increase equaled to 4.14 percentage points) and to 18.58% in 2020 (with an increase equaled to 11.41 percentage points).

Figure 1. The number and age structure of the Baltic states and the Central European countries' population over the 1960–2020 period



Source: the authors' own calculation based on World Bank data

The overall demographic dependency ratio changed slightly. In 1960, there were 0.56 incapacitated persons of any age stratum for the one working aged person. In 1990 and 2020, the

indicator equaled to 0.51 and to 0.52, respectively. In 2010, the minimum overall demographic dependency ratio for the period – equaled to 0.43 – has been recorded. At the same time, the specific demographic dependency ratios (focused on the youngest and the eldest population strata) changed essentially. The share of the elderly population stratum increased from 7.17% in 1960 to 18.58% in 2020. Meanwhile, the specific weight of the persons under the age of 14 decreased from 28.61% to 15.48%, respectively.

The elder population financial resources' distribution peculiarities, considering savings and consumption as well as the cost of healthcare for the different age strata, should be regarded in the social policy preparation processes. The sample's total population reached its own peak in 1990. Principally, its subsequent reduction was due to the next socio-political phenomena: a) the collapse of the USSR and the historically determined migration of the part of its existing population; and b) European integration, decentralization trends, and foot voting. Tiebout (1956) argued that the concept of foot voting was primarily associated with the fiscal jurisdictions' specific profiles.

The sample's average life expectancy at birth increased significantly from 67.87 years in 1960 to 75.80 years in 2020. Its maximum – 76.60 years – has been recorded in 2019. The variable's annual reduction equaled to 0.80 years in 2020 could have been caused by the global COVID–19 pandemic, which affected many elderly people.

4. 2. POPULATION AGEING IN THE SAMPLED COUNTRIES: EXPECTATIONS AND EMPIRICAL EVIDENCE

The shifts in the average life expectancy in the sampled countries in 1990–2020 (in five-year increments) are presented in the Table 1. A gradual indicator's increase was observed in most countries under study; and throughout the sample, except for Moldova and Ukraine, the average life expectancy exceeded 70 years. Regarding the entire period, the most impressive expansion of the indicator (from 69.48 to 78.35 years, an increase equaled to 8.87 years or 12.77 percentage points) was observed in Estonia. That country was characterized by a significant reduction in adult mortality and moderate fertility as well.

Table 1. Average life expectancy at birth in the Baltic states' and the Central European countries in 1990–2020, years

Country	1990	1995	2000	2005	2010	2015	2020	*1990–2020*
Bulgaria	71.64	71.05	71.66	72.56	73.51	74.61	73.61	*72.66*
Croatia	72.17	72.08	72.81	75.24	76.48	77.28	77.72	*74.83*
Czech Republic	71.38	73.07	74.97	75.92	77.42	78.58	78.23	*75.65*
Estonia	69.48	67.54	70.42	72.57	75.43	77.59	78.35	*73.05*
Hungary	69.32	69.79	71.25	72.65	74.21	75.57	75.62	72.63
Latvia	69.27	66.39	70.31	71.36	73.48	74.48	75.39	*71.53*
Lithuania	71.16	69.01	72.02	71.25	73.27	74.32	74.93	*72.28*
Moldova	67.64	66.87	67.01	67.82	69.62	71.48	72.01	*68.92*
Poland	70.89	71.89	73.75	75.00	76.25	77.45	76.60	*74.55*
Romania	69.74	69.46	71.16	71.91	73.46	74.91	74.35	*72.14*
Slovakia	70.93	72.25	73.05	73.90	75.11	76.56	76.87	*74.10*
Slovenia	73.20	73.96	75.41	77.61	79.42	80.78	80.53	*77.27*
Ukraine	70.10	66.74	67.68	67.96	70.27	71.19	71.19	*69.30*
Average	70.53	70.01	71.65	72.75	74.46	75.75	75.80	72.99

Source: the authors' own calculation based on World Bank data

Over 1960–2020, the lowest life expectancy at birth was observed in Moldova – 62.00 years in 1960; over 1990–2020, in the same country the average indicator equaled to 68.92 years, which was 4.07 years less than the sample mean. The highest growth of the indicator was recorded in Slovenia. In 1960, it equaled to 68.98 years and could be compared to the indices of Ukraine and Bulgaria (68.30 and 69.25 years, respectively). However, in 2019, just before the global COVID–19 pandemic, life expectancy at birth in Slovenia equaled to 81.53 years, which corresponded to the similar indicators in the most developed economies. Meanwhile, Slovenia (along with Greece, Italy, and Luxembourg in addition) had one of the lowest effective retirement ages in the EU – approximately 62 years. Thus, the average life expectancy after the retirement equaled to 20 years. That indicates an increase in the quality of life, but the appropriate implicit compensators – counteracting destructive changes in redistributive proportions – should supplement it. Thus, public administration measures regarding social inclusion of the elderly population and prolonging the individuals' economic activity have become vital.

The dynamics of the youngest and the eldest age strata (traditionally excluded from the working age population according to the methodology of the International Labor Organization) is represented in the Table 2. Over the 1990–2020 period, the population compositional structure and demographic dependency ratios changed crucially. While the sampled countries maintained an almost constant average share of the working age population, a shift towards an increase in the elderly demographic dependency ratio has been occurred.

Table 2. Changes in the age structure of the Baltic states and the Central European countries' population in 1990–2020, percentage

Country	Growth rate of particular age strata compared with 1990											
	Population aged 0–14						Population aged 65+					
	1995	2000	2005	2010	2015	2020	1995	2000	2005	2010	2015	2020
Bulgaria	–15,13	–27,88	–41,21	–43,73	–42,24	–42,62	10,80	18,30	15,95	16,66	25,38	29,88
Croatia	–9,87	–18,13	–28,28	–29,84	–35,35	–37,74	14,33	25,77	34,43	36,40	46,29	55,55
Czech Republic	–13,54	–24,39	–32,46	–33,03	–28,44	–24,33	4,18	8,03	9,44	23,43	44,84	64,46
Estonia	–14,91	–29,44	–41,01	–42,12	–39,04	–36,99	6,78	14,65	24,04	27,51	35,30	48,01
Hungary	–11,79	–18,86	–26,09	–29,83	–32,84	–33,66	5,51	10,42	12,85	15,27	23,17	40,82
Latvia	–9,81	–26,02	–42,49	–48,28	–47,76	–45,35	7,82	12,21	19,34	20,57	22,05	24,31
Lithuania	–5,36	–15,95	–33,21	–45,19	–49,19	–48,16	10,87	21,00	32,03	32,98	34,93	43,25
Moldova	–5,25	–17,26	–35,48	–42,98	–45,99	–49,77	8,04	11,89	16,44	17,93	15,70	32,98
Poland	–7,09	–21,84	–33,78	–39,53	–41,10	–39,76	11,41	21,31	31,61	35,16	57,58	87,28
Romania	–14,42	–24,29	–39,10	–42,03	–44,16	–45,76	13,22	26,51	34,49	31,40	39,25	53,40
Slovakia	–9,19	–21,04	–32,82	–38,55	–38,49	–36,89	6,03	12,17	15,27	23,76	40,45	68,05
Slovenia	–12,50	–24,26	–32,53	–30,80	–26,91	–23,17	15,05	32,00	45,87	60,80	74,83	105,07
Ukraine	–7,12	–23,60	–37,48	–41,19	–37,45	–35,95	12,07	9,10	20,31	15,83	13,74	20,25
Average	–10,46	–22,53	–35,07	–39,01	–39,15	–38,47	9,70	17,18	24,01	27,51	36,42	51,79

Source: the authors' own calculation based on World Bank data

The number of the elderly population significantly increased even in the countries with relatively low per capita incomes, in particular, in Ukraine and Moldova. In 2020, in Ukraine, Latvia, and Bulgaria, the number of the elderly population increased by less than 30.00% compared with 1990. The lowest indicator – equaled to 20.25% – was observed in Ukraine. In 2020, in Slovenia, along with a phenomenal increase in the average life expectancy at birth, the investigated indicator raised more than twice. Over the 1990–2020 period, on average, the elderly

population stratum induced by 51.79%, while the youngest stratum decreased by 38.47%. That fact affected both productive and consumption capacities of the respective national economies.

In 2020, in Slovenia and the Czech Republic, the number of population aged 0–14 decreased by less than 25.00%. Over the entire period under investigation, the above age stratum reduced rapidly in Moldova (–49.77%) and Lithuania (–48.16%). Among the sub-group of the Baltic countries, an essential range of variation has occurred: along with the excessive reduction in the above age stratum in Lithuania, the indicator for Estonia equaled to 36.99%. While examining the above variable, one should consider both natural population change and migration. In the latter case, institutional traditions play a key role, in particular, in terms of national informal rules regarding the composition and the size of the family as well as the system of migrants' professional competences.

Samuelson (1954) formulated an ambiguous *Serendipity Theorem*, according to which sustainable economic growth was determined exclusively by a combination of optimal fiscal decentralization and corresponding rate of natural increase. However, in the commentary, Deardorff (1976) convincingly proved that such statement was debatable, since it had been often impossible to estimate the optimal natural population change that could be able to maximize the economic agent's (fully representing the society) individual utility.

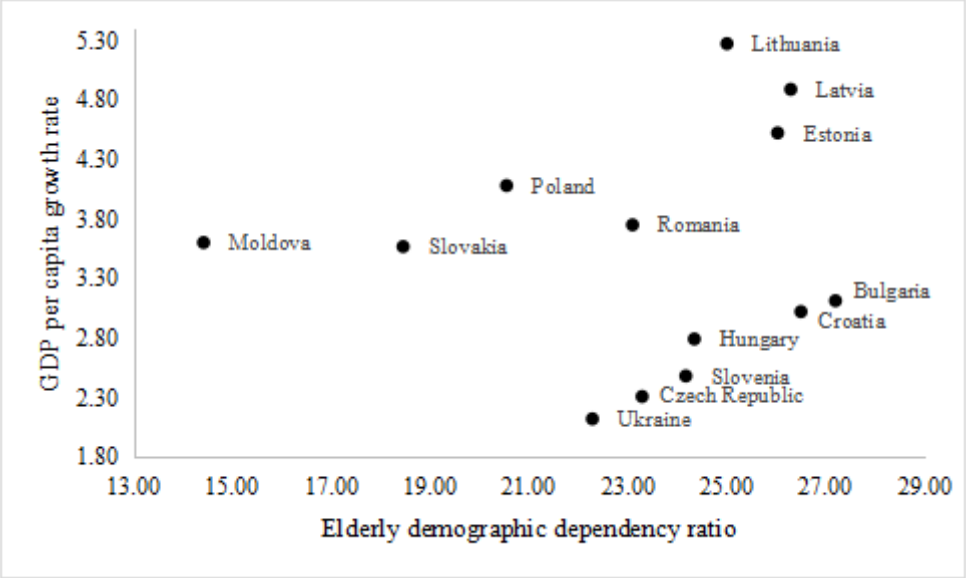
The structural changes in the population of the sampled countries partly confirm the aforementioned theorem. Population ageing appeared to be the factor that determined the design of the social production's distributive and redistributive phases. Hence, it had been appropriate to study the relationship between demographic ageing, social spending, and macroeconomic dynamics.

4. 3. MACROECONOMIC DYNAMICS OF THE SAMPLED COUNTRIES VS. POPULATION AGEING

In the context of the population ageing phenomenon, we investigated the 'post-colonial' period, when the sampled countries have restored their independence or ceased to be satellites of the USSR and participated in European integration. We analyzed the period of 1996–2021 since there were no earlier indicators for the individual countries. That interval has been heterogeneous in terms of macroeconomic dynamics. The Great Recession has divided it in half. We considered the sub-periods of 1996–2008 and 2009–2021 separately.

Regarding the 1996–2021 period, the Baltic countries were the sample's leaders in terms of economic growth rates (the average GDP per capita growth rates varied from 4.53% in Estonia to 5.28% in Lithuania). Meanwhile, all the Baltic states were characterized by comparatively high elderly demographic dependency ratios: from 25.01% in Lithuania to 26.30% in Latvia. The larger average elderly demographic dependency ratio was recorded only in Croatia (26.51%) and Bulgaria (27.21%) (Fig. 2).

Figure 2. The average GDP per capita growth and the average elderly demographic dependency ratios in the Baltic states and the Central European countries in 1996–2021, percentage



Source: the authors' own calculation based on World Bank data

In Moldova, the lowest average life expectancy at birth has been a compliment to the lowest average elderly demographic dependency ratio. Over the entire time interval, it equaled to 14.42%. Over the 1996–2008 period, the Baltic states were characterized by relatively high average economic growth (ranged from 6.82% in Estonia to 7.68% in Latvia) and rather low elderly demographic dependency ratio (ranged from 21.99% in Lithuania to 23.32% in Latvia).

Over the 2009–2021 period, considering the above sub-sample of the countries, the real GDP per capita growth rates slowed down (ranging from 2.10% in Latvia to 3.14% in Lithuania), while the average elderly demographic dependency ratios raised crucially (ranging from 28.03% in Lithuania to 29.29% in Latvia). In 1996–2008, an essential gap – equaled to 3.44 percentage points – occurred between the average elderly demographic dependency ratios in Slovakia and in the Czech Republic.

Considering the next sub-interval, the above gap deepened and equaled to 6.23 percentage points. Over the 2009–2021 period, Slovakia turned out to be almost the 'youngest' country of the sample with the ratio that equaled to 18.46%. Meanwhile, in Moldova, the average elderly demographic dependency ratio equaled to 14.42%. In 2009–2021, due to the beginning of Russian hybrid aggression and insufficient institutional development of public administration, Ukraine was the only sampled country with the negative average GDP per capita growth rates.

4. 4. STOCHASTIC MODELING OF THE INTERRELATIONS BETWEEN THE CERTAIN SOCIO-DEMOGRAPHIC VARIABLES AND ECONOMIC GROWTH IN CENTRAL EUROPE AND THE BALTIC STATES

Aiming to verify *the proposed above model 2*, we applied the ordinary least squares (hereinafter – OLS). Regarding the data availability, we investigated the entire period from 2000 to 2021 (OLS1) and two sub-intervals from 2000 to 2010 (OLS2) and from 2011 to 2021 (OLS3). The summary statistics for the sample is given in Table 3.

In the course of the study, we made 286 observations for the entire time interval. It should be noted specifically that the retirement age in the sampled countries varied significantly. The oth-

er crucial fact was that in the countries with a higher level of well-being, due to the peculiarities of healthcare and social insurance systems' composition, a plethora of the elder people retained the ability to work for a long time and, despite reaching the retirement age, continued their professional activities.

The obtained regressive analysis' results were quite controversial. Over the entire period, an increase in the working age stratum negatively affected the real GDP per capita growth rates. Nonetheless, considering the 2011–2021 sub-interval, the specially mentioned stochastic interdependence between the above variables has been positive, yet statistically insignificant. The above facts could be due to the methodology's peculiarities: only the specific weight of the working age stratum had been considered, while the human intellectual capital's quality mattered enormously.

Table 3. Summary statistics

Variables	Period	Observations	Mean	Standard deviation	Max	Min
GDPpc_gr	OLS1	286	3.72	4.53	17.99	–14.76
	OLS2	143	4.43	5.15	13.00	–14.76
	OLS3	143	3.01	3.69	17.99	–9.44
WAP	OLS1	286	68.16	2.39	74.20	62.18
	OLS2	143	69.10	1.58	73.34	66.05
	OLS3	143	67.23	2.69	74.20	62.18
EDdr	OLS1	286	23.85	4.79	33.89	13.44
	OLS2	143	21.56	3.39	26.19	13.87
	OLS3	143	26.13	4.90	33.89	13.44
GHE	OLS1	286	4.63	0.97	8.08	2.51
	OLS2	143	4.50	0.97	6.72	2.51
	OLS3	143	4.76	0.96	8.08	3.18
GCF	OLS1	286	24.49	4.96	41.56	8.93
	OLS2	143	26.44	5.37	41.56	12.66
	OLS3	143	22.55	3.58	31.33	8.93

Source: The authors' own calculation based on World Bank data

The Table 4 represents the results of the regressive analyses performed for the specifically mentioned sample.

Table 4. Regressions of economic growth on demographic variables and control, the sample of 13 countries, 2000–2021, panel data analysis

Variables	Period		
	OLS1	OLS2	OLS3
WAP	–0.676*	–0.652	0.120
	(0.237)	(0.346)	(0.652)
EDdr	–0.312*	–0.429*	0.125
	(0.119)	(0.153)	(0.359)
GHE	–1.370*	–1.676*	–1.195*
	(0.248)	(0.406)	(0.319)
GCF	0.335*	0.381*	0.319*
	(0.048)	(0.072)	(0.084)
R^2	0.236	0.267	0.128
N	286	143	143

Notes: The numbers in parentheses are the standard errors of the estimated parameters. '*' denotes significance at a 1% level. R^2 is the adjusted coefficient of determination.

Source: the authors' own calculation based on World Bank data

Prudent educational and social programs (co-financed by the respective central governments, local authorities, and private investors in addition) should ensure an essential improvement in economic development. To ameliorate the working age stratum's participation in public production, the fundamental changes in fiscal policy should be made. The taxes on labor and on capital rates optimal composition could accelerate economic growth instead of inducing negative foot voting.

The elderly demographic dependency ratio's slightly positive impact on the sampled economies' development rates – observed over the 2011–2021 period – had been statistically insignificant. Meanwhile, the elder population strata should be effectively involved in public production. The latter requires a mix of certain medical, educational, and cultural programs.

Surprisingly, over all the intervals under investigation, the domestic general GHE share in total public spending negatively affected the real GDP per capita growth rates. The above fact could be caused by incomparable healthcare spending structure in the sampled countries. To disclose the exact economic growth prerequisites, both public and private healthcare expenditures should be investigated accurately.

Gross capital formation appeared to be the only model's variable that had positive impact on economic growth and simultaneously had been statistically significant. Over the entire period of 2000–2021, an increase in GCF by 1.00 % induced real GDP per capita by 0.335%. Due to the Wicksell / Cobb–Douglas production function, investment in physical capital should be rationally combined with cultivation of human intellectual capital.

5. DISCUSSION

Demographic changes have a certain impact on the national economies' growth trends. To ensure development, national governments, local authorities, and other economic agents as well should improve their performance towards macroeconomic sustainability (Villi, 2023). The explicitly mentioned sample represented primarily emerging markets and additionally some from advanced economies.

Even though the countries under study varied significantly in terms of economic growth (especially during the 2000s), there were some specific trends common for the entire sample. In 1990, the total population of the sample reached its peak and approached 165.60 million people. Regarding the 1991–2021 period, all the countries under study were characterized by indisputable decrease in fertility and unsustainable increase in the average life expectancy. The above phenomenon was observed in the most of developed countries as well. Meanwhile, the population age structure of the sample varied substantially. The impact of the population ageing and fluctuations in the working age stratum appeared to be rather ambiguous. Moreover, an increased elderly population dependency ratio affected both production and consumption processes, forcing the respective national governments to reshape their social and demographic policies in order to achieve a sustainable increase in public welfare.

The obtained results proved that the stochastic interdependence between certain socio-demographic and macroeconomic factors appeared to be valid (while its statistical density has been rather weak). The controversial fact that an increase in the working age population stratum negatively affected economic growth could be explained by the specifically mentioned group's aggregated knowledge's and working attitude's peculiarities. In addition, the macroeconomic variables associated with investment in human capital are considered as 'growth-friendly spending' *par excellence*. The interrelations between government healthcare expenditures ap-

peared to be positive in the numerous studies (e.g., Ogundari & Awokuse, 2018, Ding, Huang, Gao, & Min, 2021, etc.). Meanwhile, a few scholars (e.g., Baser & Gokten, 2019, Yoshino, Kim, & Sirivunnabood, 2019, Terták & Kovács, 2020, Štilić et al., 2023, etc.) pointed out that undeveloped institutional environment could eliminate the positive impact of public spending on social and economic development. Thus, in emerging market economies, an increase in public healthcare spending could have a negative effect on the growth processes. In this investigation, we obtained the similar results. Additionally, not only the dynamics but also the structure of healthcare spending and the respective institutional framework matter. Moreover, considering changing demographics, the main attention should be focused on the structure of public healthcare expenditures, regarding the population's actual distribution in terms of age strata.

The model could be improved by: a) a profound investigation of the human intellectual capital's quality impact on the proportions of public production; b) an examination of the actual public and private healthcare expenditures effect on demographic dynamics in terms of longevity; and c) a complex investigation of fiscal policy's impact on the working age population stratum's economic behavior (e.g., in terms of foot voting, etc.). Not only the influence of GCF, but also that part of gross accumulation that was aimed at improving the technological structure of capital investments should be analyzed additionally to refine the model.

Public and private educational expenses (regarding economically active and inactive population strata) could ameliorate the proposed model as well. The improved model could help to prepare an effective and growth-friendly public policy mix.

6. CONCLUSION

Over the second half of the XXth century, the substantial improvements in public production, healthcare and the entire social sphere formed the prerequisites for an induced average life expectancy at birth and consequently for the unprecedented shifts in demographic structure. From the last decade of the XXth century, all advanced and most of emerging market economies have been permanently experiencing an essential decrease in fertility combined with the longevity phenomenon. Regarding the above, the social and demographic policy mix should be reshaped to increase public welfare and efficiently counteract population ageing.

We considered the sample of the Baltic states and the Central European countries. Predominantly, due to the data availability, we investigated social, demographic, and macroeconomic dynamics of the explicitly mentioned sample over the 2000–2021 period. Even though the majority of the sampled economies were characterized by similar demographic characteristics at the beginning of the time interval under study, the applied socio-demographic and macroeconomic policy mix mattered vitally in terms of their resultative public welfare.

Over the period of 2000–2021, an increase in the working age stratum specific weight adversely affected economic growth. That fact could be due to the methodology peculiarities as we assessed the quantitative instead of qualitative parameters of human capital. Specific attention should be paid to the intellectual capital cultivation processes. Over 2011–2021, an increase in the working age stratum specific weight affected the real GDP per capita growth rates positively, yet statistically insignificant. The average elderly demographic dependency ratio was negatively interrelated with economic development indices. Regarding that, the social and demographic policy mix should be focused on the elimination of the population ageing negative impact on public welfare. Hence, the respective policy profile should be updated to ensure active and efficient elderly population strata participation in the production processes. Healthcare expenditures – both public and private – should be rationalized, regarding the respective

population's actual structure to ensure the elderly strata productive involvement.

Taking the Wicksell / Cobb–Douglas production function into account, an increase in human capital requires simultaneous proportional expansion in physical capital. Thus, the taxes on labor and on capital rates optimal composition should be found empirically. Regarding all the intervals under study, gross capital formation appeared to be the only model's variable that had a statistically positive impact on economic development. Over 2000–2021, if gross capital formation raised by 1.00% the real GDP per capita growth rates have induce by 0.335%. The obtained results could be considered while preparing a growth-friendly social and demographic policy mix.

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RISK ON THE TAX SYSTEM OF THE E.U. FROM 2016 TO 2022

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ABSTRACT

This paper discusses the risks that businesses face in the tax system from the point of view of the cycle of money. The current research is about the influence of companies that participate in global tax transactions on the tax revenue. The results show that controlled transactions have a negative impact on the GDP and tax revenue, discouraging any uncontrolled investments. The diminished risk increases the tax revenue. The objective of this research is to show that a tax policy of a low tax rate increases uncontrolled transactions, leading to a growth of GDP and tax revenue. This work complies with the theory of the Cycle of Money. The impact of risk on tax revenue has been determined by comparing results with and without this factor. The Q.E. method uses mathematics and programming, allowing the determination of an appropriate equation by a feedback procedure. An econometric analysis is applied to check the results of the model. A special technique is introduced, for the first time, to identify the risk by the sensitivity impact of one factor to another one. Sensitivity is determined as the ability of one factor to counteract instantly the changes of another one. If the counteract is instant, it is considered that the sensitivity is high. If the counteract delays, it is determined that the sensitivity is low. For high sensitivity, the risk is low, and the adjustment is the appropriate one. For low sensitivity, the risk is high, as the adjustment is not adequate.

Keywords: *risks, tax system, the cycle of money, sensitivity*

1. INTRODUCTION

The objective of this study is to specify the relationship between business risk and tax revenues. The results should show that their relationship is inversely proportional. This means that the risk of the companies is a factor with a negative effect on tax revenue. To prove this a quantitative analysis should be applied. The consistency of the model depends on real data of the economy, such as GDP, GDP deflator, and Unit Labor. The GDP deflator and the Unit Labor should comply with a very weak decline or increase in GDP, this shows that are very sensitive factors as they follow instantly the GDP. Contemporaneously the investments should not be affected so much by GDP over time, this means that are more sensitive, as they adjust to the GDP more slowly. The rationale is that the companies tend to avoid the risk, and the risk is there where the companies don’t immediately follow the changes in GDP, showing their low sensitivity. The low sensitivity is making the risk higher for the companies, as they can’t counteract the

changes in the economy. This paper aims to highlight the relationship between companies and the business risks they undertake through their economic activities. The theme of this paper aims to specify the link between the economic activity of businesses and the tax system. The research problem concerns the way companies should be taxed to favor entrepreneurship and not lead companies due to tax pressures to solutions, such as controlled transactions (Saragih and Ali, 2023a). The research problem focuses on the need to mention the imposition of low taxes on companies that do not engage in controlled transactions (Boldycheva and Klonitskaya, 2022; Protsenko and Koretsky, 2023). On the contrary, companies engaged in controlled transactions should be taxed at least at a fixed minimum tax to combat tax avoidance and evasion (Mangoting *et al.*, 2021). Because when companies are in a tax system with increased taxation, businesses are directed to solutions that involve elements of tax avoidance and evasion (Lin *et al.*, 2019). For the reliability of research, not only theoretical and mathematical analysis is used, but also quantitative methods and econometric analysis (Challoumis, 2023a). This research confirms the initial hypothesis that lower taxation allows companies to reduce their business risk, and along with companies the economy improves, with better revenues, because although there is lower taxation, there are more companies that do not avoid and do not evade taxes (Carolina, Oktavianti and Hidayat, 2021). The motivation for this research was the need to clarify that lower taxation increases the money cycle because it improves both its overall economic function and its economic structure (domism) (Challoumis, 2021). Every entrepreneur knows that running his business involves accepting a level of risk, that the business may not bring profits, and that there is a risk that may be that he/she does not recoup the investment made (Drake, Lusch and Stekelberg, 2019). The amount of risk varies between businesses and is an important factor in determining the value of a business (Eberhartinger and Zieser, 2021).

Financial risk refers to the possibility that a company's cash flow is not enough to pay creditors and fulfill other financial responsibilities (Chen, 2021). The level of financial risk, therefore, does not relate so much to the activities of the enterprise and concerns more the amount of debt that a company undertakes to finance them (Suwardi and Saragih, 2023). High debt is due to defaulting on its financial obligations due to weakness (Guedrib and Marouani, 2023). Taking higher levels of debt or financial liability, therefore, increases a firm's level of financial risk (Kovermann, 2018). Business risk refers to the probability that a company's cash flow is not enough to cover its operating expenses, such as the cost of products sold, rent and wages, etc (Artemenko *et al.*, 2017). Unlike financial risk, business risk is independent of the level of debt (Boateng, Omane-Antwi and Ndori Queku, 2022). There are two types of business risks: systemic risk and non-systematic risk (Saragih and Ali, 2023b).

Systemic risk refers to the possibility that an entire market or economy will experience a recession or even fail (Maslov, Kozhevnikov and Savoskin, 2021). Economic crashes, recessions, and interest rates are common sources of systematic risk (Gita Warastri and Suryaningrum, 2022). Every undertaking active in the market is exposed to this risk, and the amount of systematic risk does not differ between undertakings in the same market (Aulia, Rosdiana and Inayati, 2022). Therefore, small business owners can reduce their exposure to systemic risk (Siagian, 2023). Unorganized risk describes the likelihood that a business or branch of business will experience a recession (Plesner Rossing, 2013). Unlike non-systematic it varies significantly from business to business (Kayahan and Murat, 2022). Sources of non-systematic risks include the strategic management and investment decisions of small business owners that they are called upon to make daily (Strauss, Fawcett and Schutte, 2020). As a result, investors reduce their exposure to non-systematic risk by diversifying their owned portfolios of a variety of companies operating in different industries (Didimo *et al.*, 2020). A business that is more exposed to risk

is worth less than an identical business exposed to less risk (Chyz *et al.*, 2021). Reducing risk is important not only to help the business succeed but also to maximize its value (Egglezakis, 2023).

More specifically, the types of risks are:

1. Business risk: Business risk includes strategic risk, financial, operational, and technological (Irawan and Turwanto, 2020).
2. Commercial risk: Market risk refers to price movements in either local or international markets. They are the most common and difficult to control (Abernathy *et al.*, 2021).
3. Operational risk: Risks are mainly due to the human factor (Wunder, 2009). They are those who are found in labor relations and any possible malfunction of human resources.
4. Tax - Legal risk: It is the risk faced by the company due to non-compliance with international and national legislative frameworks. They are usually found in matters of transactions and their dispute.
5. The last two risks are also considered very important. The tax risk is included in the law risk.
6. Liquidity risk: It is found in the inability to liquidate an investment and leads to repayment problems and default on agreements. This risk is also caused by drastic changes in raw materials or service prices that disrupt the entire business operation.
7. Finally, the credit risk is due to any possibility of a breach of a pre-agreed agreement or transaction and the consequences it brings (Mangoting *et al.*, 2022).
8. However, risk management plays the most important role as it is a series of measures and decisions aimed at reducing the difference between the intended objective and the results it ultimately achieves (Ouyang and Fang, 2022). Risk management is therefore the process of planning, organizing, and coordinating to reduce any negative impact of risk on profits (Eurostat, 2023).

Therefore, for a small, medium, and large enterprise to be able to reduce business risk today, it must initially identify its objectives at regular intervals and proceed to risk forecasts (Firmansyah, Febrian and Falbo, 2022). To initially accept a certain amount of risk according to the intended result and the philosophy that governs the management but also the general climate prevailing in the sector to which it belongs (Takopoulos, 2023).

The cooperation of executives to identify each change according to the order of conditions from which the change originates (Neuman, Omer and Schmidt, 2020).

Dealing with any kind of risk requires actions on the part of the management but also invites each small business to a new, stricter, and controlled financial framework (Challoumis, 2018b). In recent years, great reference has been made to the usefulness and importance of internal audits specifically to the internal control framework, which is the most modern way of approaching risks (Wang and Guan, 2022). Within this framework, the management of each risk is determined by the decisions of the management, the general manager, and the personnel and their cooperation (Challoumis, 2018a).

The risk faced by businesses today is multifaceted and so control is constantly imposed on the course of results concerning the general economic climate, noting the efficiency and effectiveness in the utilization of every financial data contained in the financial statements of each

business. In conclusion, business risk, business philosophy, and internal control are the factors that their examination and utilization lead every business to succeed today.

2. LITERATURE REVIEW

This paper shows that low taxation on domestic companies that do not operate based on controlled transactions seems to reduce both cases of tax avoidance and tax evasion (Hamilton and Stekelberg, 2017). To achieve tax avoidance, companies apply several methods to reduce their tax burden. Such methodological practices may in principle involve shifting their risk under transfer pricing rules to reduce their business risk by joining a tax regime, with reduced taxation. In transfer pricing, what is achieved is the shift of profits to a tax regime that has lower tax rates (Masri *et al.*, 2019). Businesses that want to achieve impairment in their business risk distribute their profits to subsidiaries located in countries with a low tax rate (Puška et.al., 2018). In this way, business risk is reduced by shifting profits to low-tax tax regimes (Vlasenko, 2023). The allocation of business risk is achieved by distributing profits to favorable tax regimes (Becker, Johannesen and Riedel, 2020). Also, businesses through equity attempt to reduce business risk. What equity achieves is the distribution of risk between the company and creditors. Equity is used to share overall risks through dividends, protecting companies from tax changes that affect them (Gertler and Hubbard, 1993). Tax evasion depends on factors related to a country's institutional framework, while wealth inequality plays an important role in tax evasion. It is becoming clear that the overconcentration of wealth is driving its displacement to countries with low tax rates (Leenders et al., 2023).

In most cases, firms normally reduce business risk. This way is by sharing risk, or by shifting it. The theory of the money cycle identifies this and argues that these amounts eventually leave the economy because of the wrong tax policy. While, the more profits a business has, the more it intensifies its efforts to reduce its taxation (Donelson, Glenn and Yust, 2022). That is why reduced taxes must be imposed on companies to tackle the loss of profits outside the economic system. Whereas, undertakings engaged in controlled transactions must be subject to a minimum fixed tax (Challoumis, 2022). What matters for companies involved in controlled transactions is the reduction of their tax burden, with the result that the economies in which they operate are deprived of significant revenues. This is made clear through the relationship that shows that business risk is inversely proportional to tax revenues (Wencel, 2022). In other words, when business risk increases, tax revenues decrease, while tax revenues increase when business risk decreases. This means lowering tax rates for domestic companies, firstly to stay in the economy and secondly to prevent any controlled transactions. This is described by the impact factor of tax revenues, which is described by the following relationship, Eq. (1). The impact factor of tax revenues of countries which are tax heaves:

$$s = \frac{k+l}{r+c+t+i} \tag{1}$$

Therefore, countries are receiving the products that are taxed in different countries. This allocation of profits between profits and losses permits the enterprises that participate in controlled transactions of the transfer pricing activities to maximize their utility. But contemporaneously the tax revenue from a global view is declined. The loss of tax income from some countries is more than the profits that make the countries which are tax havens. Thereupon, the symbol of $\tilde{s}$ is the impact factor of tax revenue from a global view, and there are some coefficients which are *k, l, r, t,* i and *c*. The symbol of *k* is about the impact factor of capital, *l* is the impact factor about the liability of the authorities on the tax system. The interpretation of the liability is about

how unbalanced it is the tax system. The parameter of r is about the risk, the t is about how trustworthy is the tax system (bureaucracy). The symbol of i examines the case of intangibles (the intangibles charged to the subsidiaries) of the tax system. Additionally, the symbol of c is about the cost of enterprises. The symbols with the "~" are accordingly the same thing but from the view of uncontrolled transactions. The numerator is proportional to the income of taxes, as the investments and the stable tax environments, with liability enhance the tax income. On the other hand, the denominator is inverted and proportional to the tax income, as the risk, the cost, and the unbalance of taxation cause less tax income. Moreover, for $\tilde{s}$:

$$\tilde{S} = \frac{\tilde{k}+\tilde{l}}{\tilde{r}+\tilde{c}+\tilde{t}+\tilde{i}} \tag{2}$$

Since Eq. (3) is determined as the aggregate impact factor of tax revenues:

$$\hat{S} = s + \tilde{s} \tag{3}$$

It is plausible the identification of the behavior of the impact factors of tax revenues in the case of tax havens, and in the case of the non-tax havens. Consequently, using the prior equations is plausible to examine the controlled and the uncontrolled transactions. In addition, $\hat{s}$ is a factor that allows the comparison between the controlled with the uncontrolled transactions. Thence can have a standalone behavior analysis of controlled transactions and a combined behavior analysis between the controlled transactions with the uncontrolled transactions. The next section analyzes the impact factor of tax revenues with the rest of the impact factors.

3. METHODOLOGY

The applied methodology is based on two steps. The first step is used for the determination of the mathematical equation, and the clarification of the theoretical background. Factors like the *k, I, l, r, c* and *t* which were clarified in the prior section, are used to compile the model, and to confirm the mathematical connection between the dependent variable of and the risk, considering the same time all the previously described factors of the economy. In the second step through VAR, Durbin - Watchon econometric approach uses GDP and other factors like GDP deflator, unit labor, and investment funds to confirm the consistency of the model. Vector Autoregressive (VAR) analysis is applied for a dynamic economy analysis model that includes the change of time lag in the variables. The dynamic behaviors of the observed variables in Vector Autoregressive analysis would be further explained by property functions, specifically the Impulse Response function and the Variance Decomposition function (Li and Xiao, 2023). A vector autoregression analysis model could also be used to predict and forecast the amount of a variable (Puška et al., 2020). The economic model is represented by the risk on the tax system model, so Vector Autoregressive analysis considers that the model, which is estimated in a specific condition, can be used to predict different time conditions. Vector Autoregressive analysis can also incorporate a shock element into the analyzed model and examine the long-term response based on historical data (Olviana et.al., 2022). The study of exchange rate fluctuations is extremely sensitive to economic shocks. Vector Autoregressive is one of the analysis tools that not only shows the causal relationship between variables but also the extent to which economic shocks influence exchange rate stability which reflects the economic character of a country and indicates the growth and development of macroeconomy (Yuliadi, 2020). Moreover, Durbin-Watson was considered for the analysis. If the Durbin-Watson value is close to zero, the serial correlation indicates that the data in the model has a strong positive influence on the residual values. If the Durbin-Watson correlation is 4, it means that the data has a negative serial correlation. When the Durbin-Watson results are close to the value range of 2, the model

is considered stable. The Durbin-Watson test considers no serial correlation between 1.5 and 2.5, indicating that the residual value has no serial correlation or that there is no autocorrelation between the residual values (Kryeziu and Durguti, 2019).

The quantification analysis of the risks of the tax system with the tax revenue from a global view is done by the application of the Q.E. method. On that ground of this method is determined the behavior analysis of mathematical equations:

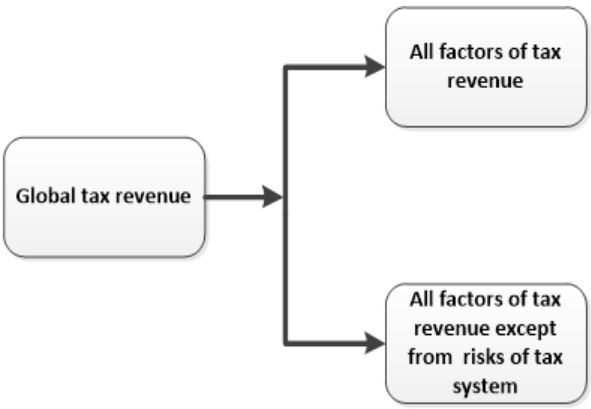
- The analysis of the behavior of the model stands on the scrutiny of the structural characteristics of each model accordingly, allowing with that way the extraction of general conclusions about the model which is under examination.
- The frequency analysis behavior scrutinizes the behavior of the dependent variables, but from the view of the number of appearances of a variable than another, estimating the impact that one dependent variable has with one or more other independent variables.

The determination of risks of the tax system is established by the impact factor of risk, which shows the level of influence of risks in the business plan of the enterprises. To clarify the way that risks affect global tax revenues:

- The first application of the Q.E. methodology uses all the factors of the global tax revenue. In that case, it is plausible to obtain the behavior of the global tax revenue using the completed form of Eq. (1).
- The second application of the Q.E. methodology uses all the factors except the factor that is under review. Thereupon, in that case, it is avoided the factor of risks of the tax system.

This methodology is illustrated below:

Figure 1. Steps of Q.E. application



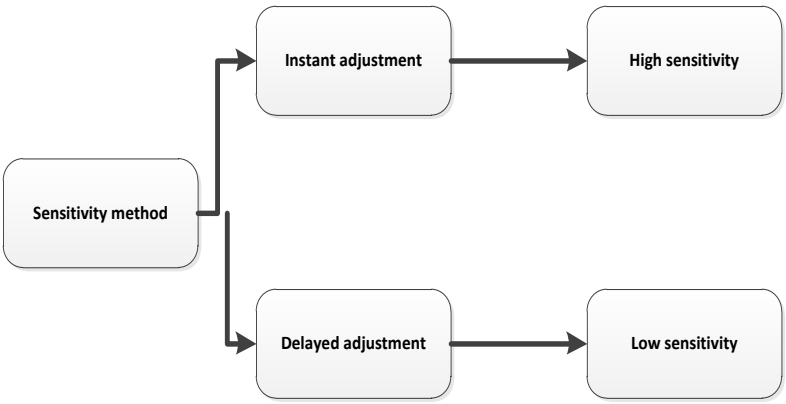
Source: Author's scheme

The previous scheme shows the methodology followed by the Q.E. method to determine the behavior of the global tax revenue in the case that there exist risks in the controlled transactions of the transfer pricing and the case that they don't exist.

Thereupon, using the previous two axes of the Q.E. method is plausible to extract conclusions about the behavior of mathematical equations, and the way that some factors react to changes. Consequently, it is plausible the transformation of quality data to quantity data. This method is applied for this study for controlled transactions and more precisely in the variables of the impact factor of the tax revenue (Challoumis, 2019). The mechanism of Q.E. is based on the dependent variable which are modified for the generator. The generator produces values for the independent variables (Challoumis, 2023b). The extracted values of the generator permit the creation of magnitudes, which are the base for comparisons, and for the scrutiny of mathematical equations. It is plausible to quantify qualitative data. In our analysis, this method is used to clarify the behavior of the impact factor of global tax revenue.

For the first time, a special technique is introduced, here is for the identification of the risk by the sensitivity impact of one factor on another. Sensitivity is defined as one factor's ability to react instantly to the changes of another.

Figure 2. Sensitivity method



Source: Author's scheme

The sensitivity is high if the counteract is instant. If the counteract delays, the sensitivity is determined to be low. The risk is high for low sensitivity, and there the adjustment is not appropriate. The risk is high for low sensitivity because the adjustment is insufficient.

4. RESULTS

The risks of the tax system are in interaction with the impact factor of tax revenues. This behavioral analysis is the model that explains the behavior of the impact factor of tax revenues with the existence and with the avoidance of the impact factor of tax entrepreneur risks.

All the necessary equations have been referred to in the previous sections, except for one condition. For the application of the Q.E. method:

$$t > l > i > r > k > c \tag{4}$$

Therefore, it is plausible to proceed to a quantity analysis using Eq. (1), (2), and (4). The examination of tangibles with the risks is critical for the transfer pricing theory. The study of risks is used many times by enterprises of controlled transactions to reach the arm's length principle.

Thence, applying the Q.E. method and choosing the appropriate values for the coefficients of global tax revenue:

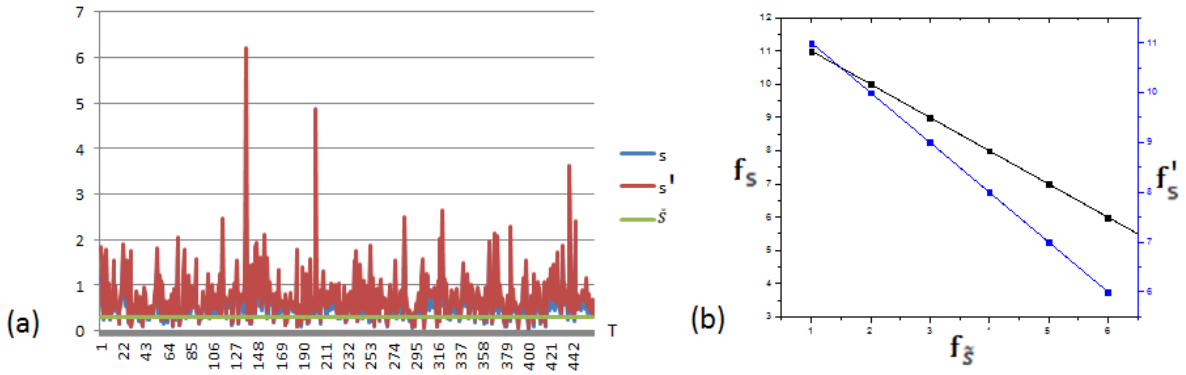
Table 1. Compiling coefficients

Factors	Values of s	Values of s’
k	0,4	0,4
i	0.6	0.6
l	0.7	0.7
r	0.5	-
c	0.3	0.3
t	0.8	0.8
fs	<0.3	<0.3
fs_i	<0.3	<0.3

Source: Author’s data

Thereupon, using the previous factors can determine the behavior of the model through the generator of the Q.E. method. The factors of the prior table have an upper limit, of 1 and a lower limit the 0. But, the factors are plausible to receive values greater than one as their mathematical structure allows this. After 461 iterations (compile) on the equations extracted next diagrams:

Figure 3. (a) Impact factors of (series 1) and (series 2), (b) Frequencies



Source: Author’s results

Figure 3 shows that global tax revenue is higher in the case that does not have the risks than in the case that has the risks. The frequency of the black line is higher than the frequency of the blue line. Figure 3 shows cases where there are risks and in the case that has avoided the risks (Challoumis, 2023c). The blue line symbolizes the case that the impact factor of has risks of the tax system. With (red line) it symbolized the case that has avoided the risks of the tax system. The global tax revenue is higher in the case that does not have the risks (red line) than in the case where the impact factor of risk is used (blue line). As expected, the existence of risks declines global tax revenues. The reason for the diminished global tax revenues is that the risks make the companies of controlled transactions stop their activities. Additionally, from the diagram (b) of Figure 3, it is obtained that the frequency of the f_s (black line) is higher than the frequency of f_s’ (blue line).

Furthermore, the Q.E. method, which is about the source code of the mathematical approach to determine the relationship between the variables, follows the econometric analysis. The estima-

tions in that case stand on the prior behavior between the variables, using VAR analysis. The VAR (Vector Autoregressive) model has the form:

$$y_t = A_1 y_{t-1} + \cdots + A_n y_{t-n} + \cdots B_0 x_t + \cdots + B_m x_{t-m} + CD_t + u_t \quad (5)$$

Where $y_t = (y_{1t}, \ldots, y_{Pt})'$ is about the vector of P endogenous observations. Finally, $x = (x_{1t}, \ldots, x_{PQ})'$ is about the vector of Q exogenous observations. D_t contains all deterministic variables, and u_t is a P dimensional unobservable zero mean white noise process with a positive definite covariance matrix.

Table 2. Data of the E.U.

Period	GDP (percent)	GDP (trillions €)	GDP deflators (percent)	Investment funds (trillions €)	Unit Labor (percent)
Q4 (2022)	1.83	-	84.60	1.586E+13	82.40
Q3	2.45	-	81.99	1.607E+13	79.98
Q2	4.39	2.902E+12	83.45	1.636E+13	81.23
Q1	5.49	2.880E+12	84.90	1.735E+13	82.77
Q4 (2021)	4.84	2.861E+12	86.57	1.781E+13	84.01
Q3	3.99	2.847E+12	88.59	1.710E+13	85.79
Q2	14.24	2.786E+12	89.38	1.665E+13	86.64
Q1	-0.80	2.732E+12	90.11	1.598E+13	88.12
Q4 (2020)	-4.11	2.735E+12	90.48	1.509E+13	88.03
Q3	-3.84	2.744E+12	90.25	1.425E+13	88.80
Q2	-14.24	2.436E+12	88.93	1.393E+13	87.54
Q1	-2.83	2.754E+12	88.12	1.311E+13	86.99
Q4 (2019)	1.18	2.851E+12	88.54	1.428E+13	86.39
Q3	1.81	2.850E+12	89.28	1.396E+13	87.46
Q2	1.60	2.844E+12	88.70	1.348E+13	87.16
Q1	1.83	2.835E+12	89.04	1.316E+13	87.35
Q4 (2018)	1.19	2.817E+12	90.04	1.222E+13	88.78
Q3	1.36	2.799E+12	90.66	1.285E+13	90.01
Q2	2.13	2.799E+12	90.28	1.262E+13	89.47
Q1	2.39	2.784E+12	91.58	1.238E+13	90.34
Q4 (2017)	3.09	2.784E+12	90.91	1.226E+13	89.43
Q3	3.04	2.761E+12	90.89	1.204E+13	89.61
Q2	2.73	2.740E+12	88.00	1.178E+13	86.94
Q1	2.17	2.719E+12	86.46	1.164E+13	86.13
Q4 (2016)	2.04	2.700E+12	87.66	1.109E+13	87.00
Q3	1.74	2.680E+12	88.39	1.088E+13	87.68
Q2	1.67	2.667E+12	88.07	1.054E+13	87.54
Q1	1.91	2.661E+12	87.47	1.026E+13	86.85

Source: Eurostat

According to the code results follow a real case scenario from the case of the E.U. (European Union), for a recent period, between 2016 and 2022:

Q4, Q3, Q2, and Q1 correspond to 3 months period, of each year. Gross Domestic Product at market prices, total economy, domestic national currency (may include amounts converted to the current currency at a fixed rate), chain-linked volumes (rebased), growth rate over one year, seasonally and working-day adjusted. In addition, Gross Domestic Product at market prices, total economy, denominated in euro, chain-linked volumes (rebased, the reference year 2010), seasonally and working-day adjusted.

Harmonized Competitiveness Indicators (HCI) is based on Gross Domestic Product (GDP) deflators. GDP is a measure of economic activity. It is the value of an economy's total output of goods and services, plus net taxes on products and imports minus intermediate consumption. GDP deflators are derived from quarterly national accounts published by Eurostat (Molchanova and Kovtoniuk, 2023). The HCIs' goal is to provide comparable measures of eurozone countries' price and cost competitiveness that are also consistent with the euro's real effective exchange rates (EERs).

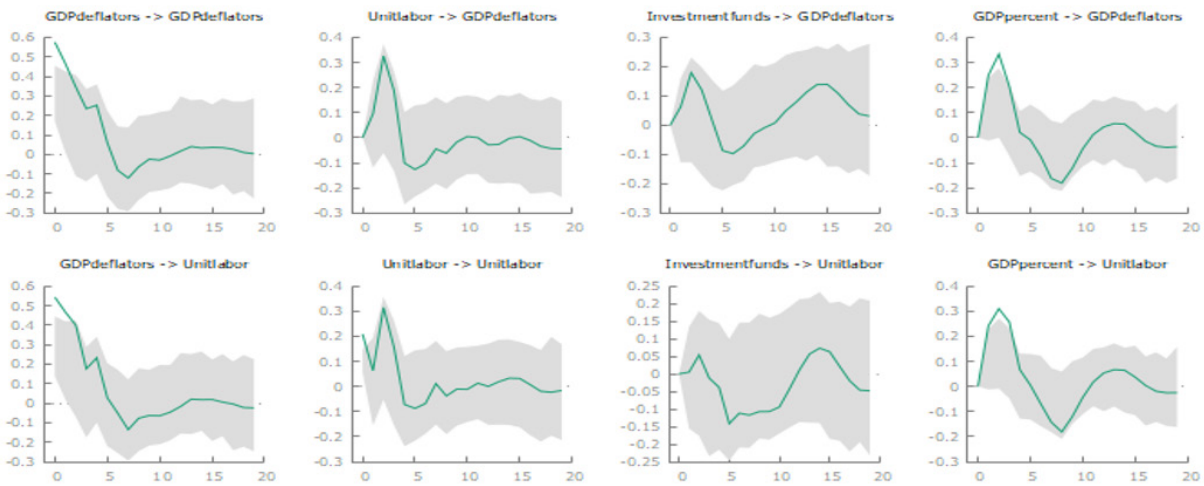
The HCIs are created using the same methodology and data sources as the euro EERs. Indicators of overall competitiveness based on unit labor cost indexes. The ratio of compensation per employee to labor productivity is used to calculate total economy unit labor costs.

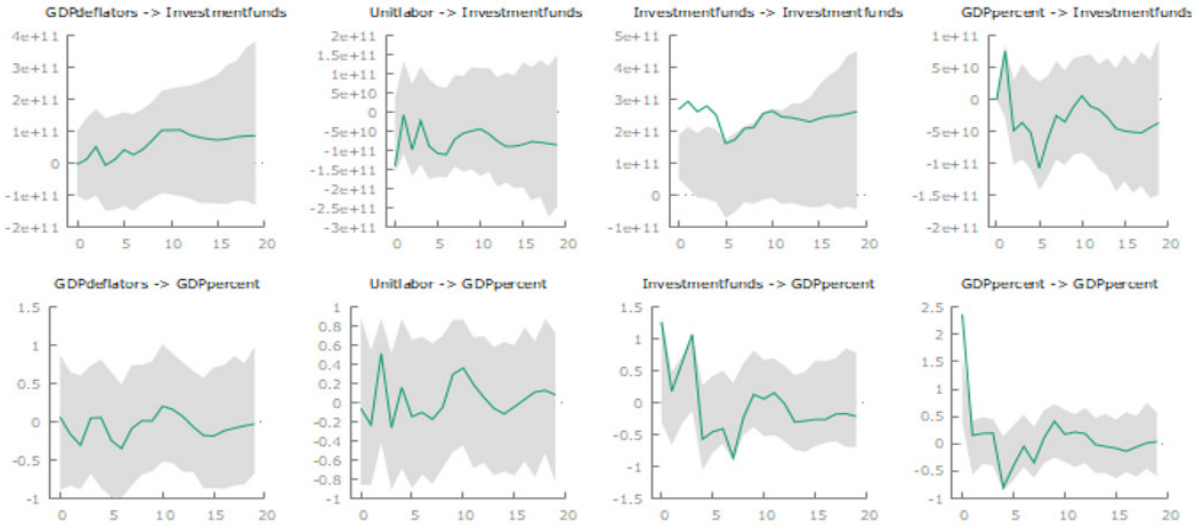
Labor productivity is calculated as GDP at constant prices divided by the total number of people employed using Eurostat's quarterly national accounts. The goal of HCIs is to provide comparable measures of price and cost competitiveness in eurozone countries that are also consistent with the euro's real effective exchange rates (EERs). The HCIs are created using the same methodology and data sources as the euro EERs. Total assets/liabilities of investment funds other than money market funds (outstanding amounts at the end of the period, total maturity, all currencies combined, denominated in euro, not seasonally adjusted, quarterly data). The estimated matrix of VAR applying Eq. (4):

$$\begin{bmatrix} GDP\ deflator \\ Unit\ labor \\ GDP\ percent \\ Investment\ funds \end{bmatrix} = \begin{bmatrix} 88.720 \\ 87.233 \\ 1.501 \\ 13579807166874.620 \end{bmatrix} [Constant] + \begin{bmatrix} u1(t) \\ u2(t) \\ u3(t) \\ u4(t) \end{bmatrix} \quad (6)$$

The VAR results according to Eq. (6):

Figure 4. Vector Autoregression result





Source: Author's results

Presenting the results for the consistency of the model:

Table 3. Correlation estimations

Equation	R-squared	Durbin-Watson
GDP deflators	0.820551	2.532614
Unit labor	0.837614	2.529852
Investment funds	0.977120	2.118941
GDP percent	0.666576	2.151586

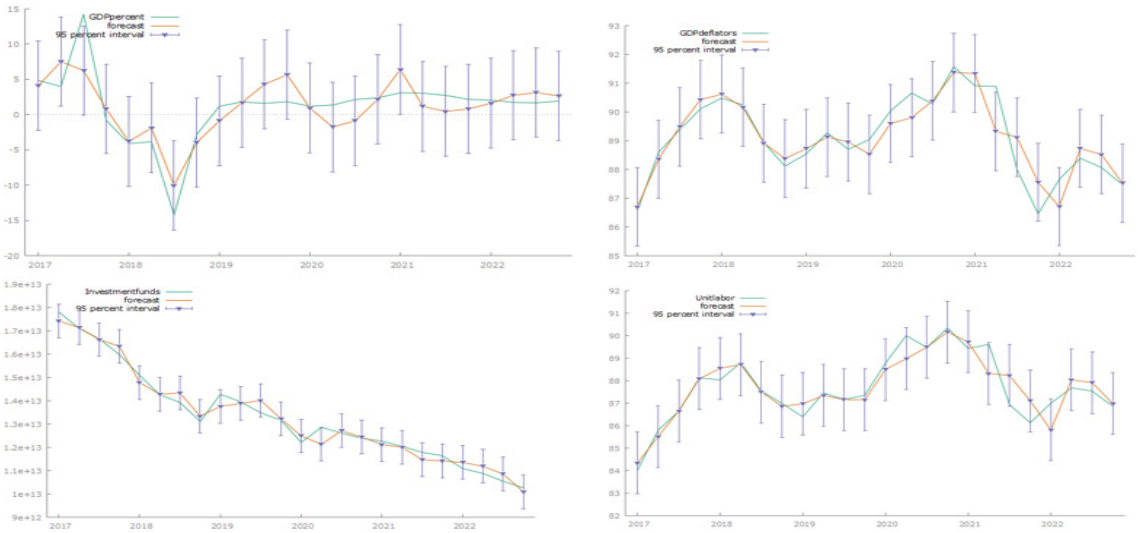
Source: Author's compile

The R-squared and the Durbin – Watson analysis reveal that the model is consistent without correlation, as the R-square has high values and the Durbin – Watson is close to values between 2 and 2.5.

5. DISCUSSION

The prior results show that the GDP relates to the capital and liability of the economy, in a real-case scenario, which are presented by investment funds. The risk, trustworthiness of the tax system, cost-price, and intangibles are presented by the GDP deflator and Unit labor.

Figure 5. GDP percent, GDP Deflator, Investments funds, and Unit labor in 0.95 intervals (Accordingly from left to right, and top to down)



Source: Eurostat

The risk as defined by prior results, by Figure 5, declines GDP, and tax revenue. Risk (presented by GDP deflator and unit labor) as expected by the prior results is inversely proportional to GDP, as Eq. (1) defined. Especially in the year 2022, the peaks of GDP Deflator and Unit labor GDP (percent) were very low. Moreover, the number of investments declined when the GDP diminished.

A unified interpretation of the elements affecting tax revenues, such as that offered by the theory of the money cycle, allows for an overall view of the economy. Other research points out that there is a link between GDP and tax revenues and confirms the current research. Such as that tax revenues and GDP are linked to each other and have a long-term connection (Dahal, 2020). As a result, the study suggests that countries with corporate tax rates that are higher than the continent average should reduce their tax rates to the mean tax rate (Eze and Owota, 2021). This research paper also determines how to increase tax revenues, which is achieved by reducing the tax rate on domestic companies while introducing a minimum and fixed tax on companies that engage in controlled transactions. So, the government should intervene in the economy to protect the companies of uncontrolled transactions from the competence of companies that participate in controlled transactions. From another paradigm, a government is taking measures to strengthen strategic, institutional, and financing mechanisms to ensure the sustainable development of special cases of entrepreneurship in a socio-economic development strategy (Huseyn, 2023). The intervention of the authorities is obvious and in different examples i.e. in the digitalization of the economy (Stepura and Kuzmak, 2023). In addition, the preparation of reports on tax expenditures and their use in the process of fiscal management has become a common practice in many countries of the world, increasing the transparency of tax systems. This is also one more hint that helps the uncontrolled transactions and shows the importance of regulation by the authorities (Sokolovska, Zatonatska and Rainova, 2023).

6. CONCLUSIONS

The objective of this study succeeded in determining the relationship between business risk and tax revenues. The results clarify that the relationship between business risk and tax revenues is inversely proportional. The risk of the companies is a factor with a negative effect on tax revenue. The GDP deflator and the Unit Labor comply with a very weak decline or increase of GDP, this shows that are sensitive factors to GDP, as they follow instantly the GDP. At the same time investments are not affected so much by GDP through time, this means that are not so sensitive to changes in GDP, as they adjust to the GDP at a slow rate. The companies tend to avoid the risk, and the risk is there where the companies don't immediately follow the changes in GDP, showing in that way their low sensitivity. The low sensitivity is making the risk higher for the companies, as they can't easily follow the changes in the economy.

Future research could happen in countries or by applying other factors affiliated with that of Eq. (1) about risk. For paradigm, extensive research could be made on the field of capital and risk, or the cost and risk on their impact on tax revenue. It could combine the current results with the capital or the costs of companies, to study the tax revenue. The sensitivity of a factor to the changes of an independent factor is used to determine the risk. The logic is that the more difficult the reaction to changes, the more difficult is to react. A similar study in future work could be made using other factors by using this technique in other factors, not only in economics but in any scientific field. Additional research in the same way could be achieved for countries and multiple periods.

The GDP deflator and the Unit Labor tend to work like a multiplier, as the diagram of Figure 5 revealed that, to a very weak decline or very weak increase of GDP, the GDP deflator and the Unit Labor tend to be very sensitive. Simultaneously the investments declined in a stable condition of GDP through time. This indicates that the companies tend to avoid the risk. This clarifies that the risk and investments are in a connection between them. Risk is inversely proportional to the GDP. The reason is that the companies tend to have lower investments than the growth of GDP, because of risk, and at the same time the prices (GDP deflator) and the unit labor market are more sensitive to changes in GDP. The GDP is inversely proportional to risk, because of the tendency of companies to avoid risk. This is the reason why the authorities should imply stable and well-fined regulations in favor of uncontrolled transactions. Because the companies are less sensitive to GDP, they have more risk by the negative changes in GDP. So, it is clarified the logic of inversely proportional relationship between risk and GDP. The compile of the program explained the prior argument and indicated that a decline in tax revenue, which is proportional to GDP, means an increased risk to the economy. Therefore, with a decline in the tax rate on the companies that do not participate in triangle transactions (or controlled transactions more generally), it is plausible to face the tax avoidance and tax evasion of the companies that participate in controlled transactions.

Risks decrease global tax revenue, reducing the number of transactions and leading companies to participate in controlled transactions. The number of firms involved in controlled transfer pricing transactions is higher than in the case where there are risks. The number of controlled transactions is lower when there are no risks, because the absence of risks increases the global tax revenue, and the companies of controlled transactions prefer to avoid tax paying causing lower tax revenue. The conclusion is that tax authorities should imply low and stable tax rates to decline controlled transactions, and to increase tax revenue, as tax risks have a negative impact on GDP and tax revenue.

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APPENDIX

The source code of analysis:

```
%Q.E. (c)(r)2017 Constantinos Challoumis for Transfer Pricing
  q=0;
  while q<10
  q=q+1;
  count=0;
  counts=1;
  counts1=1;
  counts12=1;
  counts13=1;
  counts21=1;
  counts23=1;
  while count<10
  if rand()<9
      i=0.7*rand();
  end
  if rand()<9
      c=0.6*rand();
  end
  if rand()<9
      f=0.5*rand();
  r=i+c+f;
  r1=i+c;
  r2=i;
  s_tilda=0.3;
      count=count+1
      if r<0.3 %it is one limit for comparison above than this we think s_
  tilda but is not the same one as s_tilda
              %and it is used as a meter to compare all the different
  counts1,counts2,...
              %it could take any other value, it is just a constant
          counts=counts+1;
      else
          counts1=counts1+1;
      end
      if r1<0.3
          counts12=counts12+1;
      else
          counts13=counts13+1;
      end
      if r2<0.3
          counts21=counts21+1;
      else
          counts23=counts23+1;
      end
  end
  end
  tec=[count,counts,counts1,counts12,counts13,counts21,counts23,i,c,f,r,r1,
  r2;tec];
  end
```

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ANALYSIS OF HEXAGON FRAUD MODEL, THE S.C.C.O.R.E MODEL INFLUENCING FRAUDULENT FINANCIAL REPORTING ON STATE-OWNED COMPANIES OF INDONESIA

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ABSTRACT

This research aims to analyze the influence of each Hexagon Fraud factor that causes fraudulent financial reporting, namely Pressure, Opportunity, Rationalization, Arrogance, Capability and Collusion based on respondents' perceptions of the content. The research methodology used is a quantitative method, sample determination was carried out using a purposive sampling method with certain criteria. The questionnaire was distributed to 3 leaders and 3 officials based on the selected sample. Primary data was obtained to test 6 research hypotheses based on the answers of 96 respondents from 16 State-Owned Enterprises (SOEs) from the selected sample. Data processing uses Smart PLS version 3.00 to test validity and reliability and test research hypotheses. The results of research on hexagon fraud theory show that Opportunity, Arrogance and Capability have a positive and significant effect on Fraudulent Financial Reporting, while Pressure, Rationalization and Collusion do not have a significant effect on Fraudulent Financial Reporting. Research findings reveal that fraud perpetrators are parties who have a deep understanding of the company's internal control policies, especially knowledge about the effectiveness or ineffectiveness of internal controls, both from within and from outside SOEs. Fraud perpetrators may come from leaders or officials who are knowledgeable about the organizational structure and governance of officials in strategic positions.

Keywords: *Arrogance, Capability, Collusion, Hexagon, Opportunity, Pressure, Rationalization*

1. INTRODUCTION

Fraudulent financial reporting can raise doubts among investors about management, and also has the potential to criticize the accounting profession. The Association of Certified Fraud Examiners (ACFE) states that fraudulent financial reporting practices can threaten a country's economic activities (Association of Certified Fraud Examiners (ACFE), 2018). Association of Certified Fraud Examiners Indonesia, (2019) also shows that fraudulent practices have caused a loss of around 5% of a company's gross income. Many conflicts of interest are caused by personal interests of employees, management or executives cannot be disclosed so that they have a negative impact on the company(Wells, 2017). Conflicts of interest between several officials and employees in management can be one of the causes for management to commit fraud. Based on agency theory, where management acts as an agent, meanwhile and investors or the government as principals, in accordance with this agency theory, principals and agents act as

long as they provide benefits and convenience and have the potential for fraudulent financial reporting. Moreover, fraudulent financial reporting is an act of fraud that is consciously carried out by top management to present a convincing financial statement rather than real financial statement (Albrecht, W.S, Albrecht, C.O, Albrecht, 2018). The company management can present improvements in its performance in a financial statement, but in some cases this information only aims to give an impression to readers of the financial statement (Kayoi & Fuad, 2019). Fraudulent financial reporting has a high long-term risk to the company's business activities (Kayahan & Murat, 2022). To prevent greater fraud, companies must be able to develop strategies to prevent fraud (Sihombing & Rahardjo, 2014). However, it is not only necessary to develop a fraud prevention strategy, but also to detect fraudulent practices early on in the company, and to understand the methods used to detect fraud. In carrying out audit planning and realizing the audit program, auditors and forensic accountants must be more careful in dealing with risk factors and fraud (Devy, et.al, 2017). Fraud is an act of a person within a company who misleads users of financial reports because fraudulent acts can change the financial reports. Fraud is carried out to deceive users of financial reports by correcting them so that the company's poor performance does not appear. In general, fraud by companies is very dangerous for the country's economy. In several cases of fraud that have been revealed, starting with ordinary fraudulent practices to fraud carried out by companies that will go public through IPO activities to deceive their investors (Puspitadewi & Sormin, 2018).

ACFE, 2019 revealed that state-owned companies in position number 3 often commit fraud, and these companies are the go public state-owned companies. There are several cases of window dressing carried out by PT Asabri and PT Garuda, and window dressing itself can change the picture of company profits to deceive users of financial reports (Kayoi & Fuad, 2019). Meanwhile, Suhartono et al., (2021) revealed a dual position, namely the main director of PT Garuda Indonesia (Persero) and the main commissioner of PT Sriwijaya Air. This condition creates unhealthy competition because both of them work together to determine ticket prices. Financial reporting that contains fraud can create long-term risks that damage the company's business (Shemshad & Karim, 2023). Therefore, companies need to develop fraud prevention strategies to detect potential fraud early (Sihombing & Rahardjo, 2014). Not only in preparing strategies to detect fraud, but also starting from the preparation of audit planning and audit programs, auditors or forensic accountants must be more careful in anticipating the risk of fraud (Devy et al., 2017). Many cases of fraud as described are still ongoing today, even the theory of fraud has developed in 6 phases of development to reach the hexagon theory of fraud (Vousinas, 2019).

The choice of State-Owned Enterprises as research objects is because in a SOE there are many interests, including the interests of the government as the majority shareholder, the interests of management, and the interests of individuals, both the interests of party officials and career officials. Meanwhile, SOEs is also a company that has a very large market capitalization so it is not surprising that there is a lot of fraud, especially financial statement fraud. The difference between this research and previous research is that this research raises the psychological aspect of perceptions of fraud in fraudulent financial reporting by distributing questionnaires to SOEs employees after the Covid-19 recovery period is over. The data is processed using Smart PLS version 3.00 because the data collected is primary data. In previous research which also used hexagon fraud theory (Rizkiawan, 2021), it was revealed that 5 of the 6 hexagon Fraud factors, namely opportunity, rationalization, pressure, capability and collusion, had an effect on fraudulent financial reporting on SOES, while arrogance had no effect to that reporting. However, the research data processing carried out (Rizkiawan, 2021) uses logistic regression with Fraud

financial reporting as the dependent variable with using the M score while the 6 hexagon factors of Fraud and Corporate Governance as independent variables.

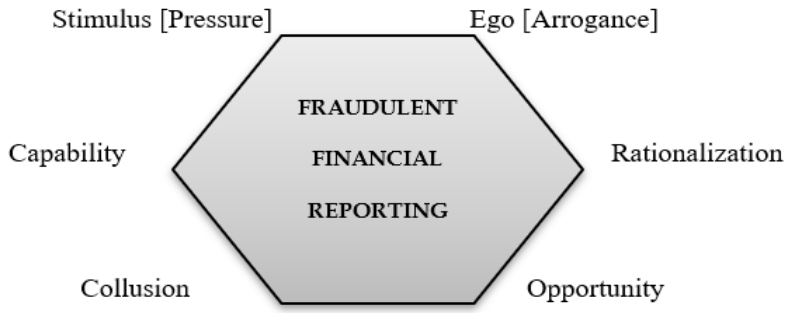
2. THEORICAL FOUNDATION OF RESEARCH

2. 1. THE BRIEF DEVELOPMENT OF FRAUD THEORY TOWARD TO HEXAGON THEORY OF FRAUD

The development of fraud theory has developed into 6 theories. The theory of fraud begins with the emergence of white-collar crime, where at that time the victim of the crime did not feel that he was a victim of economic and business crimes because the crime was committed professionally. Sutherland, (1940)explained that this white-collar crime was different from street crimes that occurred during the second world war in the European region. White-collar crimes are carried out in a structured manner and include criminal acts because they harm the general public without them knowing it, which is then known as fraud. In the following developments, this white-collar crime became the basis for the triangle theory. The triangle theory of fraud by (Cressey, 1950), was one of the impacts of the European economic recovery after the second world war. Cressy, (1950) has deepened his understanding of white-collar crime and revealed that there are 3 factors that give rise to fraud in organizations or companies that carry out activities in the economic and business fields where these crimes are detrimental to the general public or citizens, namely pressure, opportunity and rationalization. Pressure to do an act because of compulsion. Financial pressure, for example; fraud due to lifestyle and drug addiction. Opportunities to commit fraud can be reduced by strengthening internal control, for example: the courage to commit fraud is limited for fear of being detected by tight internal controls. abuse of authority and lack of supervision. Rationalization is interpreted as justification for the perpetrator of fraud so that he feels that his actions are legitimate (Moraliyska, 2023). Of the three factors that trigger fraud, what needs to be highlighted is the opportunity because it starts with an opportunity so that financial pressure can be channeled after obtaining some justification. The next stage of development is marked by the presence of the Scale Theory of Fraud as stated by (Albrecht, W.S, Albrecht, C.O, Albrecht, 2018) as a correction to the Triangle Theory of Fraud because the triangle theory of fraud was considered not clear enough. In the Fraud Scale Theory, situational pressure factors as corrections for financial pressures, opportunity factors are corrected to become opportunities for fraud, and personal integrity factors as corrections for rationalization. Situational pressure to assess the condition of each individual when committing fraud, whether they feel guilty or not. The opportunity to commit fraud depends on the risk borne by the perpetrator of the fraud. Personal integrity factor to assess the potential to commit fraud based on past character (). These three factors are interdependent on each other, namely the possibility of high fraud occurring under conditions of situational pressure and the opportunity to commit fraud is high but personal integrity is low, or the probability of fraud is low because one has high integrity even though situational pressure and opportunity to commit fraud remains low (Ahmić & Isović, 2023). Then, on the fraud scale theory, personal integrity is an important factor related to detecting fraud, including fraud financial reporting. In subsequent developments, the pentagon theory of fraud or A-B-C analysis emerged, with additional factors in the fraud triangle theory, namely capability and arrogance (Wolfe & Hermanson, 2004). Capability is a very important factor to be able to commit fraud because fraud perpetrators have the capability to minimize the risk of their actions, and according to (Dorminey, 2011) that capability is related to adequate ability to commit fraud so that the higher a person's capability, the higher his ability to commit fraud. Subsequent developments from fraud theory led to the Diamond theory of fraud and M (Money), I (Ideology), C (Coercion) and E (Rights).

This Diamond Fraud Theory wants to clarify that the main factor that must be considered is the behavior of the perpetrators of fraud(Dorminey, 2012). The Hexagon Theory of Fraud still uses the factors of Pressure [Stimulus], Capability, Collusion, Opportunity, Rationalization and Ego [Arrogance] which influence the occurrence of Fraud, and what is meant by fraud in this study is Fraud Financial Reporting. Fraud theory has reached a new phase marked by the release of the Hexagon theory of Fraud known as the S.C.C.O.R.E Model by (Vousinas, 2019) as shown in figure 1 below.

Figure 1. The S.C.C.O.R.E. Model



Source: Vousinas, 2019

The explanation of the five factors referred to above is the same as in the previous fraud theory, it's just that there is an additional collusion factor. According to Vousinas, 2019, Collusion is an agreement between a first party and a second party with the aim of deceiving a third party.

2. 2. FRAUDULENT FINANCIAL REPORTING

According to (Association of Certified Fraud Examiners (ACFE), 2018),fraud in financial reporting can be interpreted as fraud committed by management through exercising control in the form of artificial or deliberately engineered misstatements in financial reports. Fraudulent Financial Reporting can be interpreted as planned fraud, actions that violate the law, and intend to benefit certain parties (Kayoi & Fuad, 2019). This action not only deceives users of financial statements, especially it can mislead investors in reading a financial report. According to(Bryan et al., 2002) the Statement on Auditing Standards (SAS) No.99, fraudulent financial reporting can be done: a. Deliberately manipulating, falsifying, or changing accounting records or supporting documents when preparing financial reports. b. Intentional errors or omissions in information that are significant to the financial statements. c. Committing a misuse of principles relating to amount, classification, method of presentation, or disclosure. Todorović et al., (2020) underlines the importance of Anti-Fraud Strategy to be developed for decreasing many cases of fraud and corruptions.

3. METHODOLOGY

3. 1. DATA SOURCES

This research is categorized as quantitative research because this research aims to obtain data, and process it with Smart PLS to test hypotheses, then analyze the results of this research to answer the research phenomenon. The population of state-owned enterprises officially registered in 2018-2022 is 107 companies. The sample was determined using a purposive sampling method with certain criteria, namely 107 companies - 4 companies with incomplete data - 87

companies did not go public, so the valid sample is 16 companies. The 16 selected companies were then visited to distribute questionnaires to be answered by 3 leaders and 3 employees. The questionnaire was answered by 96 respondents or 16 companies x 6 respondents. Data collected from the first source is classified as primary data (Puška et al., 2020). According to (Sugiyono, 2018), primary data is a data source that directly provides data to data collectors so that the data obtained is data that comes from first hand, and has not been further processed for any purpose. Smart PLS is a data processing application that is more widely used for primary data where filling out questionnaires is based on a Likert scale. In addition, Smart PLS is a sophisticated application that can be used without many assumptions (Juliana et al., 2022), such as normality tests and multicollinearity tests between these variables (Ramzan & Khan, 2010). It can even be used in all data scale categories, from nominal, ordinal, interval to ratio data scales (Puška et al., 2018). Another advantage of Smart PLS is that the data used can be under 100 respondents(Ghozali, 2006), like this research.

The research objects are 16 state-owned companies go public on the Indonesian Stock Exchange (IDX). The specificity of state-owned companies because companies whose share ownership by the Government of Republic of Indonesia is above 51%, and is certainly suitable for fraudulent financial reporting. Based on these 16 companies, research questionnaires were then distributed with taking respondents 3 leaders and 3 employees for each company.

Table 1. List of Research Indicators

Variables	Indicators	Question	Sources
Fraudulent Financial Reporting (FFR)	1. Accounting Records 2. Disclosure 3. Inappropriate Budget Allocation 4. Cost Standards 5. Fraud 6. Manipulation 7. Gratification	12	(ACFE, 2019) (Vousinas, 2019) (Desviana et al., 2020)
Pressure (PRE)	1. Pressure from superiors 2. Accounting Standards	5	
Opportunity (OPP)	1. Organizational Structure 2. Internal Control 3. Policy 4. Facility	4	
Rationalization (RAT)	1. Follow up 2. Review	2	
Arrogance (ARR)	1. Directing of Work 2. Work of Guidelines 3. Discussion about Work 4. Decision making 5. Career	6	
Capability (CAP)	1. Initiative 2. Knowledge 3. Awake of Failure 4. Communication 5. Help to Friend	7	
Collusion (COL)	1. Self-aware 2. Reprimand 3. Burden of work 4. Integrity	4	

Source: Data processed by Author, 2023

Table 1 shows the indicators that are translated into research questions using a Likert scale. The sequence of research variables is based on the sequence of fraud theory journeys starting from diamond fraud theory to hexagon fraud theory.

3. 2. RESEARCH HYPOTHESIS

3. 2. 1. PRESSURE ON FRAUDULENT FINANCIAL REPORTING

Shareholders or investors as principals in a cooperation contract hand over responsibility to management who acts as an agent to get good company performance. Along with high expectations from shareholders, there is pressure felt by management in formulating strategies so that these expectations are met. Pressure can give rise to the idea of committing fraud in the company's financial reports carried out by management in meeting the interests of shareholders. Financial Target is a condition where the pressure felt by the manager in achieving the economic goals obtained by the manager and the company's president director.

Financial targets are measured by the Return on Assets (ROA) indicator which presents a profitability ratio calculated by dividing profits with assets utilized (Kushnir et al., 2023). The manager's idea to commit fraud on financial statements by manipulating the ROA ratio is by increasing this ratio from the company's profits to the assets used (Skousen & Twedt, 2009). Therefore, it can be concluded that the higher the financial target proxied by ROA profitability, the greater the opportunity for companies to practice fraud in the company's financial reports. This is supported by the results of research from (Wiharti & Novita, 2020), (Kayoi and Fuad, 2019), (Maryadi et al., 2020), (Santoso, 2019) which stated that financial targets had a significant positive influence on fraud in financial reporting. Financial targets from anywhere, especially from the shareholders or investors to the company's management, will certainly affect the way of management makes it happen. Based on agency theory that the management as an agent works in accordance with the authority and responsibility it receives from shareholders or investors as principals. In the real world, shareholders or investors always demand management to always obtain satisfactory performance regardless of the condition of the company. This demand puts pressure on management to be able to display performance that satisfies the shareholders or investors even though it does not always succeed in realizing it. Management that is less successful in meeting financial targets from shareholders or investors tends to commit fraud on financial statements so that financial statements look better. For the purposes of financial ratio analysis, the company can commit fraud against the number of records in the desired posts. A pressure can be in the form of pressure to increase financial ratios, such as ROA, ROE, ROI, Net Profit, EPS by comparing the results of the ratios of the last year with the results of the ratios of the previous year.

H1: Pressure has a positive effect on Fraudulent Financial Reporting

3. 2. 2. OPPORTUNITY ON FRAUDULENT FINANCIAL REPORTING

Crime is not only the intention of the perpetrator but also the opportunity, so be aware, be aware. Another jargon that golden opportunity will not come twice in a lifetime. Any crime, including fraud, can occur because of the opportunity and the perpetrator of the crime will dare to carry out his actions when he is sure that his actions will not be detected by other parties. The reason people commit fraud is because the internal control conditions are not so good that people who don't think about committing fraud think about doing it. Internal control and opportunity are inversely proportional, the tighter the internal control, the lower the opportunity, so it should be. Related to the ineffectiveness of internal control explained by(Siddiq, F,R, 2017)1953 that

the tightness of internal supervision depends on the ratio of the board of commissioners serving in the company with the record that the board of commissioners is able to detect fraud earlier and provide security for company assets (Zhukevych & Zhuk, 2023). This discussion is in line with what was stated by (Putriasih,K, 2016) that ineffective internal control has an effect on fraudulent financial reporting. However, in other studies the opportunities that arise due to the lack of effective internal control have no effect on fraudulent financial reporting (Damayani et al., 2019)financial target, external pressure, managerial ownership, ineffective monitoring, nature of industry, change in auditor, change in directors, and frequent number of CEO's picture. While dependent variable is financial statement fraud.Population on this research areinfrastructure companies that listed in Indonesian Stock Exhange (IDX,(Bawekes, H.F, Simanjuntak A.M, Daat, 2018).

H2: Opportunity has a positive effect on Fraudulent Financial Reporting

3. 2. 3. RATIONALIZATION ON FRAUDULENT FINANCIAL REPORTING

According to SAS No. 99 (2002) that an auditor must have awareness of the occurrence of fraud in financial statements, especially related to the rationalization indicator. Rationalization is a behavior that considers that the fraudulent act that has been carried out does not deviate from the existing regulations so that it is appropriate to do so and the perpetrators of fraud always look for justifications for their wrong actions.

Factors that can indicate risk include ineffective value communication, management that participates excessively but does not participate in financial aspects, and management's excessive interest in increasing or maintaining the entity's profit trend. Other factors that indicate the risk of fraud can be seen from management activities in minimizing profits to be reported to taxation, as well as the attitude of management trying to justify an accounting treatment that is trivial or not supported for material reasons. The relationship between the company's internal and auditors that is not always in line or looks tense, both the previous auditor and the successor auditor can be a factor causing the rationalization risk in financial statement fraud. Because of this explanation, it can be concluded that the poor relationship between auditors and management is due to the failure of management to operate the company's finances, and the behavior of earnings management in the company is related to the factors causing financial statement fraud from rationalization.

Findings of fraud in financial reporting or fraud trails detected by the old auditor can be avoided by replacing auditors within the company. This motivates companies to replace external auditors to avoid detecting fraudulent financial reporting (Skousen & Twedt, 2009). In the two-year period there was a change in the services of a public accountant which could indicate the occurrence of fraud. Previous findings from research (Novitasari & Chariri, 2018), (Koharudin & Januarti, 2021)financial target, external pressure, and (Maryadi et al., 2020), show a positive influence between change in auditor and fraudulent financial reporting. The higher rationalization can be seen from the change in the services of public accounting firms. Based on this, it can indicate that fraudulent financial reporting is getting higher.

H3: Rationalization has a positive effect on Fraudulent Financial Reporting

3. 2. 4. ARROGANCE ON FRAUDULENT FINANCIAL REPORTING

According to (Koharudin & Januarti, 2021) that arrogance is shown in a person's lack of conscience to empathize with others and feel he has superiority and the right to be greedy which

makes him confident that he is immune to control. Meanwhile, in the KBBI, arrogance includes an attitude that is arrogant, haughty, and arrogant towards someone who feels superiority in himself which is manifested in an attitude that likes to be pushy or arrogant. Usually occurs in people who are in the highest position, their careers are on the rise or are experiencing rapid development in their business. In large companies, the arrogant attitude of a leader is very common.

Arrogance can have a negative impact, both on individual companies and corporate companies because it can damage company operations (Horwath, 2011). Then continued by (Horwath, 2011) that there are 5 elements of arrogance from the perspective of the CEO, namely:

a. Arrogant actors tend to look like celebrities rather than the authority of a CEO.
b. Perpetrators feel immune to internal controls and are less likely to be detected.
c. Perpetrators have characteristics as people who like to disturb
d. The perpetrator has a habit of leading his subordinates in an authoritarian way
e. Arrogant perpetrators tend to acutely lose their position or status.

The number of photos of the president director appearing narcissistically in the company's annual report can show the level of arrogance or superiority concerned.

H4: Arrogance has a positive effect on Fraudulent Financial Reporting

3. 2. 5. CAPABILITY ON FRAUDULENT FINANCIAL REPORTING

Not everyone has the ability to be able to commit fraud without being detected by the company, and successful acts of fraud are always due to knowledge and experience so that the perpetrators of crimes are said to have the ability or competence. Wolfe & Hermanson, (2004) revealed that it is impossible for individuals who do not have individual abilities or capabilities to be able to commit fraud, especially fraudulent financial reporting, without cooperating with insiders, namely those who have the capability to work with the system. In the case of changing directors, the company's performance is not always getting better because the new director is not necessarily as good as the previous one. Moreover, the longer the transition period when a vacuum occurs, the greater the potential for fraud that can be exploited. During periods of stress will increase the possibility of fraud (Wolfe & Hermanson, 2004). It could be that the reason for changing the director is one of the efforts to eliminate traces made by perpetrators of fraud so that fraud cannot be detected and conditions remain safe for him. In line with the research results of (Siddiq, F,R, 2017)1953, (Faradiza, 2019), it is revealed that capability, in this case the ability of fraud perpetrators to change the situation of changing directors, affects fraudulent financial reporting. With this discussion, the hypotheses that can be raised are:

H5: Capability has a positive effect on Fraudulent Financial Reporting

3. 2. 6. COLLUSION ON FRAUDULENT FINANCIAL REPORTING

Collusion can be classified as a moral crime because with collusion people are willing to make payments for trade to benefit themselves or their group. Collusion comes from the Latin collusion which means a secret conspiracy to carry out unethical work (Sihombing and Rahardjo, 2014). The unethical act could be in the form of an act that is punishable by a criminal act, such as taking advantage of manipulating financial reports or fraudulent financial reporting. Based on this, collusion can be projected as an act that is not good and is detrimental to the company. Wilopo, (2006) stated that several cases of collusion such as the cases at WorldCom, Enron,

Xerox were also caused by unethical acts. Likewise, the collusion case that occurred four years before at CIMA (2002) also occurred because companies had low ethics, which led to high fraudulent financial reporting. Moreover, another case of collusion is the protection of authority and position to commit fraudulent financial reporting (Beaulieu & Reinstein, 2010). Including other unethical acts such as political connections are also detrimental to the company. The company has political connections with the government, privileged to get help from the government in dealing with difficult economic conditions. When loans are made continuously and are not restrained, there will be certain parties who take advantage of engineering accounting records so that fraudulent financial reporting occurs. Another opinion originating from (Vousinas, 2019) states that collusion includes white collar crimes which occurred a lot in the early days after the end of the second world war. Companies that get many buyers for working on government projects, have the potential to commit collusion because fraud perpetrators have a great opportunity to manipulate accounting records and financial reports (Sari & Nugroho, 2020). With this discussion, the hypotheses that can be raised are:

H6: Collusion has a positive effect on Fraudulent Financial Reporting

3. 3. STATISTICAL ANALYSIS

This study uses a quantitative method to test the hypothesis of the independent variable against the dependent variable based on empirical data. Quantitative analysis is used to measure research data so as to produce information that can be interpreted in analysis and discussed to determine conclusions, suggestions and implementation. Operationalization of independent variables, are elements of the Hexagon Theory of Fraud including, Pressure (PRE), Opportunity (OPP), Rationalization (RAT), Arrogance (ARR), Capability (CAP) and Collusion (COL), with one dependent variable, namely Fraudulent Financial Reporting (FFR). The author chooses to use empirical data on state-owned companies that go public on the Indonesian stock exchange in 2022 with the consideration that all fraud detection elements, namely S.C.C.O.R.E affect fraudulent financial reporting in the Hexagon Theory of Fraud scheme. The selection of the sample was determined by purposive sampling based on certain criteria so that the population of 20 companies became 16 sample companies. Questionnaires were distributed to the 16 companies with 6 officials per company each, so there were 96 respondents.

To determine the quality of the data, validity and reliability tests are carried out on the outer model so that it is suitable for further processing in smart PLS 3.00 on the next stage. This validity and reliability test includes 3 criteria, namely convergent validity, discriminant validity and composite reliability. The next stage is to carry out hypothesis testing on the inner model to determine the influence of each element of hexagon fraud on fraudulent financial reporting. Then a discussion of the results of hypothesis tests on 6 research hypotheses is carried out.

4. RESEARCH RESULTS

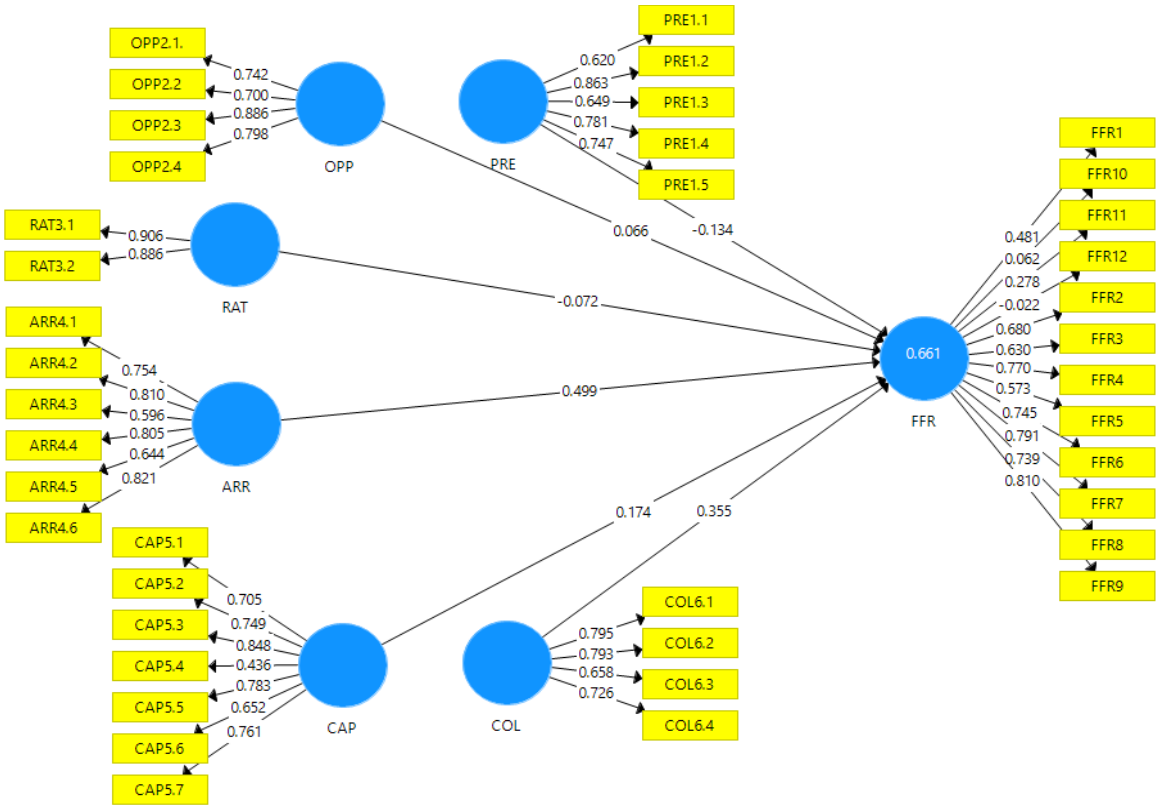
4. 1. OUTER MODEL

Before testing the hypothesis, validity and reliability tests were first carried out to determine the feasibility and reliability of the data. Smart PLS version 3.00 processes the outer model based on 3 criteria, namely Convergent Validity, Discriminant Validity and Composite Reliability**.**

Convergent Validity, reflective measurement model based on the correlation between item scores estimated using Smart PLS version 3.00. Individual reflective measure is said to be high if it correlates > 0.700 with the construct being measured. The research model that has been

made in the framework of thought is continued and the same model is made again in the Smart PLS version 3.00 application accompanied by all the indicators used in the operationalization of variables. The following presents the initial model of this research as shown in Figure 2 below.

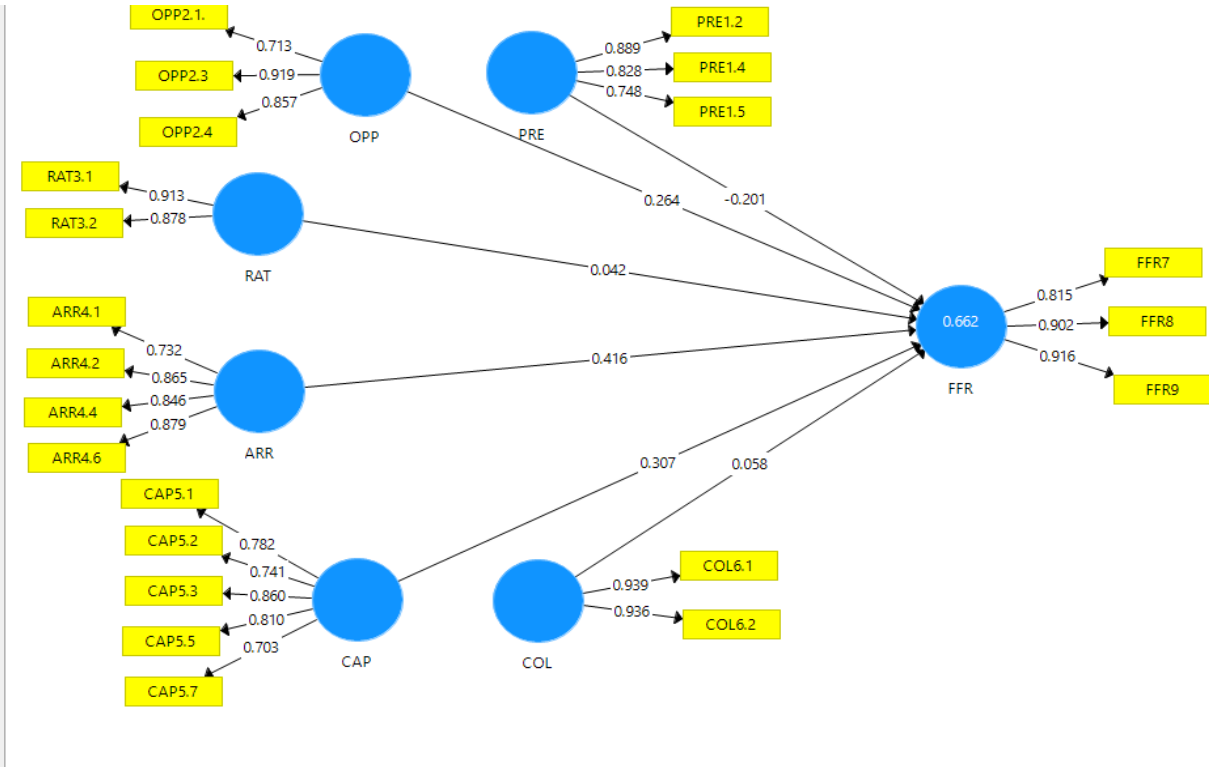
Figure 2. Outer Loading Result, First Run



Source: Data processed by Smart PLS 3.00

To obtain a final result that meets the criteria > 0.700 and up to the last run, the indicators that eliminate successively are PRE1.1, PRE1.3, ARR4.3, ARR4.5, CAP5.4, CAP5.6, COL6.3, FFR1, FFR2, FFR3, FFR5, FFR10, FFR11 and FFR12. on first run, then OPP2.2 dan COL6.4 on second run. Then the removed third run is the FF4 indicator. Finally, on the fourth run, the FFR6 indicator was removed. The following is presented last run outer loading in Figure 3 below:

Figure 3. Outer Loading Result, Last Run



Source: Data processed by Smart PLS 3.00

Based on figure 3 it is known that all the loading values of each construct have shown a value of 0.700 so that the data using convergent validity is said to be good.

Discriminant Validity, for ensuring that all concepts of each latent variable are different from other variables. Good discriminant validity if each loading value of each indicator of a latent variable has the greatest value over other loading values as shown in table 2 below.

Table 2. Result of Process for Discriminant Validity

	ARR	CAP	COL	FFR	OPP	PRE	RAT
ARR	1.833						
CAP	0.758	0.781					
COL	0.457	0717	0.937				
FFR	0.751	0.739	0.493	0.879			
OPP	0.764	0.738	0.468	0.715	0.834		
PRE	0.781	0.728	0.575	0.606	0.752	0.823	
RAT	0.738	0.647	0.384	0.637	0.740	0.689	0.896

Source: Data processed by Smart PLS, 2023

Composite Reliability, the reliability value of each construct can be seen in the Average Variance Extracted (AVE) results, and a construct is said to have a high reliability value if the value is > 0.700 and the AVE is above 0.500.

Table 3. Result of Process for Composite Reliability and Average Variance Extracted [AVE]

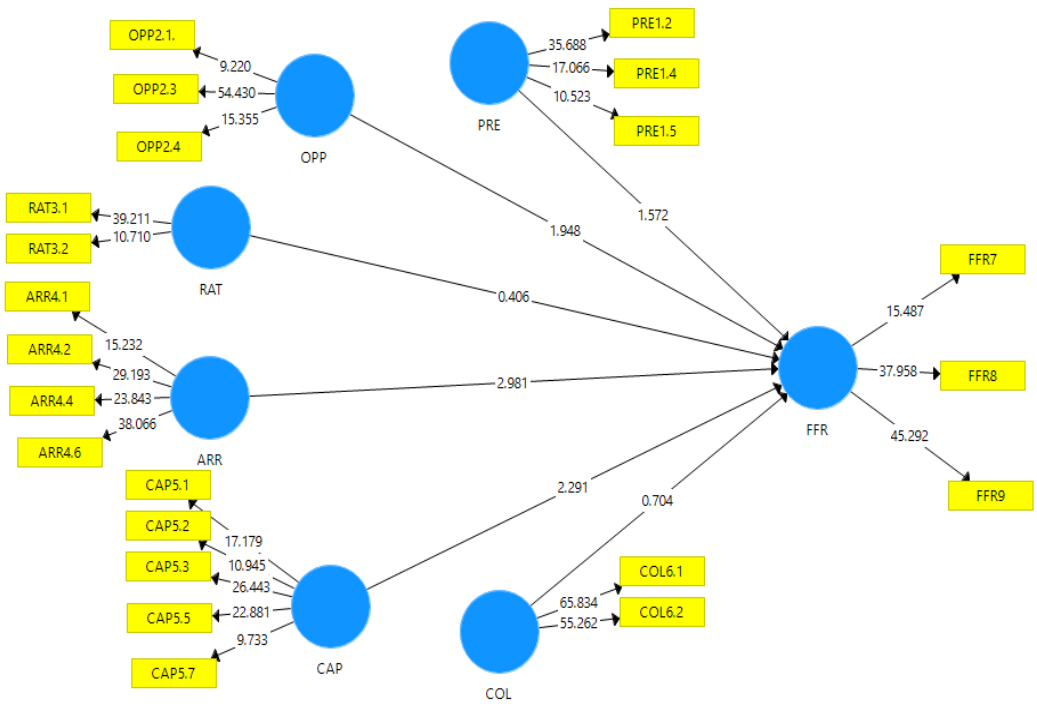
	Composite Reliability	AVE
Pressure [PRE]	0.863	0.678
Opportunity [OPP]	0.872	0.696
Rationalization [RAT]	0.890	0.803
Arrogance [ARR]	0.900	0.693
Capability [CAP]	0.886	0.610
Collusion [COL]	0.935	0.879
Fraud Financial Reporting [FFR]	0.910	0.772

Source: Data processed by Smart PLS, 2023

Based on Table 3 that composite reliability is above > 0.700 and AVE > 0.500, it can be said that the construct presented can be recommended as a reliable construct.

Inner Model, in testing the inner model or structural model, it is carried out to determine the effect between constructs, significance value and R-square. The following is presented in Figure 4 as a structural model that has been tested.

Figure 4. Result of Evaluation for Inner Model



Source: Data processed by Smart PLS, 2023

To test a model, Smart PLS version 3.00 starts by looking at the R-square for each dependent variable. In this research, the variable is Fraud Financial Reporting, as shown in table 4 below.

Table 4. Output of R-Square

Variable	R-square
Fraudulent Financial Reporting [FFR]	0.662

Source: Data processed by Smart PLS, 2023

Based on the R-square results of 0.662, it means that Fraudulent Financial Reporting is influenced by the combined contribution of pressure, opportunity, rationalization, arrogance, capability and collusion of 66.2%.

Hypothesis Test

Hypothesis testing was carried out to determine the effect of one variable on another variable, and in this study the data needed for the need for hypothesis testing has been processed by Smart PLS can be presented in table 5 in the form of results for inner weights below.

Table 5. The Result for Bootstrapping to Research Data

	Original Sample	Sample Mean	Standard Deviation	T Statistics	P Values
Pressure ➔ Fraudulent Financial Reporting	-0.20	-0.18	0.13	1.57	0.12
Opportunity ➔ Fraudulent Financial Reporting	0.26	0.24	0.14	1.95	0.05
Rationalization ➔ Fraudulent Financial Reporting	0.04	0.05	0.10	0.41	0.68
Arrogance ➔ Fraudulent Financial Reporting	0.42	0.41	0.14	2.98	0.00
Capability ➔ Fraudulent Financial Reporting	0.31	0.32	0.13	2.29	0.02
Collusion ➔ Fraudulent Financial Reporting	0.06	0.06	0.08	0.70	0.48

Source: Data processed by Smart PLS, 2023

Technically, hypothesis testing is done by bootstrapping the sample to minimize data abnormalities. (Aisyah et.al, 2019). The results of testing the hypothesis by bootstrapping based on smart PLS version 3.00 are as follows:

Hypothesis Test 1: Pressure has a positive effect on Fraudulent Financial Reporting

The first hypothesis test shows the effect of Pressure on Fraudulent Financial Reporting with a path coefficient of -0.20 with a t-value of 1.57. This calculated t value is smaller than t table (1,661), then on other criteria it is known that P value (0.12) ≥ alpha (0.05), so based on these two criteria it is stated that the first hypothesis is rejected, meaning that Pressure has no effect on Fraudulent Financial reporting

Hypothesis 2 test: Opportunity has a positive effect on Fraudulent Financial Reporting

The second hypothesis test shows the effect of Opportunity on Fraudulent Financial Reporting with a path coefficient of 0.26 with a t-value of 1.95. This calculated t value is greater than t table (1,661), then on other criteria it is known that P value (0.05) ≥ alpha (0.05), so based on

these two criteria it is stated that the second hypothesis is accepted, meaning that Opportunity has a positive and significant influence on Fraudulent Financial Reporting

Hypothesis 3 test: Rationalization has a positive effect on Fraudulent Financial Reporting

The third hypothesis test shows the effect of Rationalization on Fraudulent Financial Reporting with a path coefficient of 0.04 with a t-value of 0.41. This calculated t value is smaller than t table (1.661), then on other criteria it is known that P value (0.68) ≥ alpha (0.05), so based on these two criteria it is stated that the third hypothesis is rejected, meaning Rationalization has no effect on Fraudulent Financial reporting

Hypothesis 4 test: Arrogance has a positive effect on Fraudulent Financial Reporting

The fourth hypothesis test shows the effect of Arrogance on Fraudulent Financial Reporting with a path coefficient of 0.42 with a t value of 2.98. This calculated t value is greater than t table (1,661), then on other criteria it is known that P value (0.00) ≤ alpha (0.05), so based on these two criteria it is stated that the fourth hypothesis is accepted, meaning Arrogance has a positive and significant influence on Fraudulent Financial Reporting

Hypothesis 5 test: Capability has a positive effect on Fraudulent Financial Reporting

The fifth hypothesis test shows the effect of Capability on Fraudulent Financial Reporting with a path coefficient of 0.31 with a t value of 2.29. This calculated t value is greater than t table (1,661), then on other criteria it is known that P value (0.02) ≤ alpha (0.05), so based on these two criteria it is stated that the fifth hypothesis is accepted, meaning Capability has a positive and significant influence on Fraudulent Financial Reporting

Hypothesis 6 test: Collusion has a positive effect on Fraudulent Financial Reporting

The sixth hypothesis test shows the effect of Collusion on Fraudulent Financial Reporting with a path coefficient of 0.06 with a t value of 0.07. This calculated t value is smaller than t table (1.661), then on other criteria it is known that P value (0.48) ≥ alpha (0.05), so based on these two criteria it is stated that the sixth hypothesis is rejected, meaning Collusion has no influence on Fraudulent Financial reporting

5. DISCUSSION

The results of this research show that of the six factors that trigger people to commit fraudulent financial reporting, there are three factors, namely opportunity, arrogance and capability. Meanwhile, other factors that do not influence fraudulent financial reporting are pressure, rationalization and collusion. Based on the research results, pressure or stimulus has no effect on fraudulent financial reporting, even though the hypothesis states that pressure or stimulus has a positive influence on fraudulent financial reporting. A number of questions asked to respondents regarding pressure from superiors and accounting standards were answered smoothly, namely that there was no pressure in doing work and superiors were not able to dictate to subordinates whether to do or not do a job. Therefore, fraudulent financial reporting can occur without pressure or stimulus. Research questions related to the content of pressure and stimulus have not yet touched on the sanctions imposed on those who commit fraud in financial reports. These findings indicate that financial pressure influences fraudulent financial reporting. Meanwhile, pressure from aspects of implementing accounting standards and receiving stimulus is not yet strong enough to force fraud. This result is in line with the opinion of (Khamainy et al., 2022), (Sukmadilaga et al., 2022) which measures pressure or stimulus factors with financial targets and financial stability and reveals that pressure does not affect fraudulent financial re-

porting. Meanwhile, results that are not in line with the results of this research are those from (Yadiati, 2023) and (Sudirman & Ornay, 2023) who found that pressure actually had an effect on fraudulent financial reporting, even in research (Sudirman & Ornay, 2023) it was revealed that there was a significant effect of pressure on fraudulent financial reporting moderated by political connections.

Opportunity shows a significant influence on fraudulent financial reporting. The availability of opportunities has the potential to create fraudulent financial reporting. When respondents were asked about organizational structure, internal control, policies and facilities, it was seen how tight the organizational structure was, and how good internal control was, how good the physical security of company assets was, and how sophisticated the available facilities, there are still weaknesses, and they can be exploited. In the end, what really determines is the attitude of people who always want to look for and take advantage of opportunities. The research results show that opportunities arise due to weak internal control systems which influence fraudulent financial reporting. A similar opinion from (Alyani et al., 2023) & (Mulya et.al, 2019) states that the availability of opportunities influences fraudulent financial reporting. The opposite results, Dewi C.K, & Yuliati A, (2021) reveal that even though there is no opportunity at all, fraudulent financial reporting still has an impact. Other similar opinions from (Khamainy, 2022) and (Yudiati, el.at, 2023), (Sumadilaga et.al, 2022) expressed that opportunity influences fraudulent financial reporting, there were even findings of insignificant influence from (Raihan Noval Akbar, et. al. 2022), (Chantia, et.al, 2021), (Sudrajat, et.al, 2023). Not all SOEs employees are good and trustworthy people, but because they do not have the opportunity to commit fraud. This opinion is in line with (Chantia et.al, 2021), (Alyani et.al, 2023) that weak internal supervision creates opportunities to commit fraud on financial reports. Another opinion from (Raihan Noval Akbar et al., 2022), (Sudrajat et al., 2023) reveals that whether internal control is effective or not has no impact on fraudulent financial reporting. Apart from that, another opinion states (Dewi & Yuliati, 2022) that the effectiveness of internal supervision has a negative effect on fraudulent financial reporting. According to (Rahma et al., 2022) there are eight special functions that a state-owned company must have and one of the most important is that the state-owned company provides goods and services that the community needs. This state-owned company function was chosen because of its relevance to the preparation of financial reports (Dluhopolskyi & Zhukovska, 2023). Rationalization does not affect fraudulent financial reporting. The company has responded quickly to follow up on all findings and provide direct advice to complete and evaluate these findings, however this policy has no effect at all on fraudulent financial reporting. Fraudulent financial reporting does not only occur on the issue of whether the response given to the findings is continued or discontinued or for other reasons. In line with research by (Khamainy, 2022), (Yadianti, et.al, 2023) & (Sumadilaga et.al. 2022) that rationalization has no significant effect on fraudulent financial reporting. SOEs employees do not have the courage to commit fraud because they work as career officials and not from a particular party. However, this is not in line with the research results of (Sudirman et.al. 2023) that the rationalization element influences fraudulent financial reporting, even the influence of rationalization on fraudulent financial moderation by political connections has a significant effect, although indirectly. Arrogance has a significant effect on fraudulent financial reporting based on the results of research indicator answers, namely work direction, work guidelines, work discussions, decision making and career. These results are in line with research (Dewi, C.K & Yuliati, 2021), (Sumadilaga, et.al, 2022) which revealed that arrogance or ego influences fraudulent financial reporting empirically. Measuring arrogance by highlighting content related to work, decision making, and career was different from the results of company CEO arrogance selfies. The arrogance factor is not only visible from the many selfie photos in the annual report,

but is also visible in the origin of officials who occupy strategic positions. Fraudulent financial reporting like this can happen and the perpetrators are almost certainly committed by public officials. The arrogance of political party administrators who are placed in SOEs could have the potential to commit fraud in financial reports. However, there are opinions that are not in line with arrogance influencing fraudulent financial reporting from (Chantia et al., 2021), (Raihan Noval Akbar et.al, 2022), (Khamainy, 2022), (Sudirman, et.al. 2022) & (Yadianti, et. al, 2023) that a stylish CEO image in annual reporting has no effect on financial report fraud because the photo is just narcissistic. In contrast to career officials from SOEs, they do not like taking selfies in annual reports.

Capability has a significant effect on fraudulent financial reporting. Answers to questions asked to SOEs leaders and employees regarding indicators of initiative, knowledge, awareness of failure, communication and helping friends show that not only technical competency of human resources but also soft skills influence fraudulent financial reporting. Soft skills have proven their usefulness in planning fraud, supported by good technical capacity. almost all cases of fraud are committed by skilled insiders looking for opportunities in adversity. The results of this research are in line with research by (Yadianti et.al. 2023) & (Sudirman et.al, 2022) stated that capability significantly influences fraudulent financial reporting, only in the research of (Yadianti et.al. 2023) & (Sudirman et.al, 2022) will pay more attention to the issue of director changes. Discordant opinions from (Khamainy, 2022) & (Sudirman et.al 2022) are that changes in directors have no effect on fraudulent financial reporting.

Collusion has an insignificant effect on fraudulent financial reporting and questionnaire questions asked by SOEs leaders and employees, regarding indicators of self-awareness, warnings, workload and integrity, cannot influence fraud. Collusion occurs for other reasons unrelated to self-awareness, reprimand, workload, and integrity. The research results are in line with Kaimainy's research, 2022, that indicators of collusion using COSO internal control have no effect on fraudulent financial reporting. Meanwhile, opinions that are not in line with the results of this research come from (Sumadilaga, et.al. 2022), (Sudirman, et.al. 2022) & (Yadiati et.al. 2023) determines that collusion has an effect on fraudulent financial reporting.

6. CONCLUSION

Based on the results of research using premier data with the influence factors in the hexagon Fraud theory on Fraudulent Financial Reporting, it can be concluded that:

1. It has been empirically proven that there are 3 factors from the hexagon Fraud Theory that influence Fraudulent Financial Reporting, namely opportunity, arrogance and capability. By paying attention to the type of research that takes SOEs leaders and employees as research objects, the measurement of fraud and fraudulent financial reporting is based on a human approach. In the case of opportunity, no matter how good the company regulations are and how strict the internal controls are, there are still individuals who can take advantage. The ability to understand Standard Operation Procedures [SOP] and career paths makes employees try to commit fraud, and this arrogance is almost the same as the arrogance in the number of CEO photos in annual reports. The ability to learn tricks at work so that you become capable of doing things and are supported by opportunities so that you have the potential to commit fraud.

2. However, the factors of pressure, rationalization and collusion empirically apparently have no effect on fraudulent financial reporting. Any pressure has no effect on fraudulent financial reporting, whether economic and financial pressure such as financial pressure, financial sta-

bility and financial targets or psychological pressure at work. Rationalization and collusion have no effect on fraudulent financial reporting because the hexagon fraud theory measurement indicators are only based on respondents' answers.

For further research, for obtaining the best research that the author suggests:

1. In measuring hexagon fraud: Stimulus, Capability, Collusion, Opportunity, Rationalization, and Ego, moderating variables can be used for each of these factors to obtain information about the direct and indirect influences on fraudulent financial reporting.

2. The research object can be expanded by adding respondents to all SOEs, both go public and non-go public SOEs.

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FACTORS AND DETERMINANTS OF THE DEVELOPMENT OF HUMAN CAPITAL IN RURAL AREAS IN THE CONDITIONS OF GLOBAL CHALLENGES

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ABSTRACT

The development of rural areas is a complex and dynamic phenomenon, the effectiveness of which depends on food security and the economic activity of the population. The urgency of these issues is exacerbated by unprecedented challenges for Ukraine and the transformation of the legal field under martial law. The study aims to determine the factors and determinants of the development of human capital in rural areas in Ukraine, considering the experience of the EU countries in the conditions of global challenges. It is substantiated that the policy adopted in the state to ensure the development of rural areas based on the principles of inclusiveness should be based on balanced instruments, methods, and levers capable of minimizing external and internal threats to agribusiness. Essentially, people's opportunities and abilities for economic and social activities, as well as for their own development, are critical. It has been proven that the determining factor in this process should be human capital. The motivation for economic activity in the village is singled out from personal factors. In its absence, all prerequisites for urbanization are formed. In this context, the upward dynamics of the indicator of the share of the urban population in the EU countries, which can become an obstacle to the development of business in rural areas, was analyzed and revealed. Attention is paid to the prospects of small businesses in rural areas. The relationship between the urbanization indicator and the human development index in Ukraine and the EU countries was studied.

Keywords: *human capital, rural areas, global challenges, inclusive development, determinants of development*

1. INTRODUCTION

Developing rural areas worldwide and Ukrainian practice is becoming a key parameter in state policy. Foreign countries, particularly the EU, are focused on progressive changes in agriculture and its differentiation, the formation of drivers, and sources of investment. In most countries, agriculture has become a strategic branch of the economy, which satisfies the food program, forms the budget, and brings foreign exchange earnings from exports. And although in developed countries, the share of agriculture in GDP is not significant (up to 3%), this industry is of strategic importance for developing other industries: chemical, processing, and energy industry, as well as trade, tourism, etc.

Among the main reasons that determine the different levels of development of rural areas are: other trends of economic growth, incomes of rural families; economic inequality; lack of equal and fair access of agricultural producers and residents of rural areas to investments (Calicioglu, et al., 2019).

Modern agriculture is focused on productive manufacturing, as well as on the multifunctional development of rural areas. Regional concepts in different countries have their differences, but, as a rule, they put forward similar goals: environmental protection, socio-economic effects, rural revitalization, employment, cultural heritage, etc.

The vital sphere of ensuring the sustainable development of rural areas under transformational conditions is measured to intensify investment activity. The issue of creating a favorable investment climate in rural areas is a complex one that requires state regulation. Such a policy for developing tools for activating investment processes is closely related to the level of risk and human capital.

Suppose the level of investment risk is determined by the state of the economy and the state's monetary policy. In that case, it is more predictable from the point of view of financial analytics. Evaluating human capital is a rather complex and multifaceted procedure, especially in the context of individual territories (rural territories). Scientists study individual components of human capital and the factors that influence them (Ballatore et al., 2019; Yang et al., 2017), analyze the meaningful features of closely related concepts (labor resources, labor potential, human potential, human capital) and their connection (Fraumeni, 2008; Goldin et al., 2020). During such an analysis, all conclusions converged on the fact that society's educational, intellectual, and creative component is a decisive factor in the region's economic growth and a source of income formation for a specific individual, enterprise, and state. Furthermore, the environment acts as a factor in human potential. In contrast, the same climate is renewed in the form of an increase in the educational, professional, technical, and cultural levels of the population of the rural area. Certain features are imposed on the formation of human capital by the trends towards digitalization of the economy, namely on the process of its intellectualization (Arefieva et al., 2019).

Therefore, human capital is a part of human potential, which turns into an asset because of inclusion in labor activity and allows one to obtain planned economic and social effects. We understand the human capital of rural areas as having the ability to form, renew, develop, and improve, i.e., it is not a constant but a dynamic characteristic. It is a controlled value that changes under the influence of the actions of the state and man, the management of which must be provided, considering specific determinants of development. Human capital has spatial and temporal characteristics, and its size is the result of investment and accumulation. One of the influencing factors is income level, which can be reinvested in further development by acquiring additional knowledge, qualifications, and relevant skills. The story of the country and the quality of life and income of citizens are affected by so many factors that it is often difficult to identify the critical elements among them. The selection of appropriate criteria for analyzing human capital and developing rural areas is also an equally complex process; the quality depends on correctly identifying factors and determinants, considering the global challenges nowadays.

2. LITERATURE REVIEW

Separate issues of analysis of the influence of social and economic factors on the possibilities of ensuring human development in certain countries and their regions have become the object of active scientific discussions in many works of scientists and international institutions.

For a long time, the level of human development has been a primary indicator that forms the basis of identifying problems, fundamental contradictions, and measures to adjust the state policy of the socioeconomic development of the world's countries.

Modern challenges for rural areas are mostly reflected in the decrease in the quality of essential services, the trend of depopulation, increased vulnerability to external shocks (Kachniewska, 2015), the formation of concrete, specific requirements of rural areas (Zavratnik et al., 2019). Accumulating, they exacerbate existing discontent in their communities.

When considering options for ensuring the social and economic development of rural areas, researchers also rely on the concept of an intelligent village (Zavratnik et al., 2019), whereby the presence of internal advantages becomes essential as a guarantee of accelerating the potential development (Nieto et al., 2019) of a particular territory. The applicability of such an approach requires certain digital transformations in the country as a whole and in rural areas. In practice, digital exclusion risks are associated with spatial factors (territories without Internet access, weak connection) and social factors (age, level of education, financial capacity). Anastasiou et al. (2021) confirm that rural areas often suffer from poor network infrastructure, which limits access to information and services aimed at socioeconomic growth. But there are other reasons to suspend the case; when developing the list and content of digital services, local knowledge, and needs should be considered.

Karachyna et al. (2020) see the effectiveness of territorial branding as the source of the development of rural areas, which can be formed primarily through the activities of local self-government bodies of rural communities, public organizations, and universities. Also, the regulatory policy conducted under decentralization becomes essential for such purposes. The study of the relationship between the level of human development and institutional quality is presented in the work of Stryzhak et al. (2022), which proved that most countries with high governance quality also have a high human development index.

In today's conditions, more and more countries are considering further development of the "green" economy (Soderholm et al., 2020) and innovations related to implementing circular economy principles at agricultural enterprises as a priority direction of farming investments.

Some authors, in the results of their research, emphasize the need for human development through knowledge management and programming training (Akimov et al., 2021; Samoliuk et al., 2021), as well as regulation of the employment sphere and provision of fair incomes (Kolluru et al., 2021) , which is relevant for many countries of the world, in particular Ukraine, which did not have time to recover from the pandemic and is suffering from military aggression. In such difficult conditions, the problems of urbanization, low digital literacy, and the low image of rural residents became more acute.

No matter what detailed measures are developed in theory, in practice, it is challenging to implement them and achieve the established goals of human development of rural areas without considering the territorial specificity caused by the relevant cultural traditions, climatic conditions, soil conditions, and legislative regulation. The European Union is an exciting and unique example of regional economic integration and standard agricultural policy. The impact of the provisions and features of implementing the Community Agrarian Policy (CAP) on rural development (Spasojević et al., 2017) is under consideration, and it is also emphasized that agriculture has the highest costs to the regional budget. It is distinguished by its focus on developing rural areas and its predominant cooperation with other sectors and politics. Although

agriculture and human development in rural regions constantly interact, this policy is criticized for its territorial approach and subsidies for rural development (Topić et al., 2016).

Ballatore et al. (2019) wrote about the peculiarities of human capital in urban and rural areas (using the example of Italy), citing population mobility as a crucial factor in the gap between these levels of human capital. Youth migration depends on the conditions and availability of offers on the labor market, housing prices, and the availability of human capital in a particular area.

The dependence of human capital development on investments in education, health care, and infrastructure is also observed. Also, among the factors affecting human capital, scientists single out the mechanisms of state policy to correct the differences between the working conditions of women and men and prove the importance of investing in human capital (Mora et al., 2016). The analysis of the nature of the impact of inequality in human capital investment on the urban-rural income gap (Yang et al., 2017) is of scientific interest. In this aspect, there are also inequalities in the involvement of individual territories in innovation and investment development programs initiated by the countries' authorities.

3. AIM OF THE RESEARCH

The study aims to determine the factors and determinants of the development of human capital in rural areas in Ukraine, considering the experience of the EU countries under the conditions of global challenges.

4. METHODS

Theoretical materials for writing the article were data obtained based on generalizations of scientific literature on human capital development. The research information base was supplemented with data from international organizations and specialized expert agencies of Ukraine. Some results of the conducted research, the author's developments, and recommendations are presented using a graphic visualization method. In writing the article, a set of general scientific (analysis and synthesis, abstraction, and systematization) and specific economic research methods (monographic, economic-statistical, economic-mathematical) were also used.

Discriminant analysis was used to substantiate the list of factors and test the hypothesis regarding the degree of their influence on human development. It is a method of economic-mathematical modeling, during which a function or several of them are determined, which can classify a phenomenon considering several discriminating variables and the probability of each typed object belonging to the corresponding group (Tabachnick et al., 1989).

The general description of this function should be presented as follows:

$$y_1 = a_{1l}X_1 + \ldots + a_{1p}X_p + a_{10} \quad (1)$$

$$y_m = a_{m1}X_1 + \ldots a_{mp}X_p + a_{m0} \quad (2)$$

The dependent variable y represents specific scores as linear functions of other discriminant variables (x) and several parameters (a).

The specified combinations are designed to determine the most significant difference between groups and to minimize the difference within groups.

Discriminant analysis refers to classification groups with prior training. Unlike, for example, cluster analysis, when preliminary classifications of potential groups within the set are not specified, within the framework of discriminant analysis, it is assumed that the assignment of a specific object to a group that is most often characterized by a qualitative value already exists, based on which the analysis is carried out.

In the general case, the problem of discrimination is presented as follows: let the result of observing objects be the realization of a *k*-dimensional random vector $x = (x_1, x_1, ..., x_k)^T$. It is necessary to define a rule according to which, according to the observed value of the vector *x*, the object belongs to one of the possible sets φ_i, $i = 1, 2, ..., l$.

To construct a discrimination rule, the entire sample space of vector values is divided into areas R_l, $i = 1, 2, ..., l$ l in such a way that with the removal of *x* from R_i, the object belongs to the set φ_i.

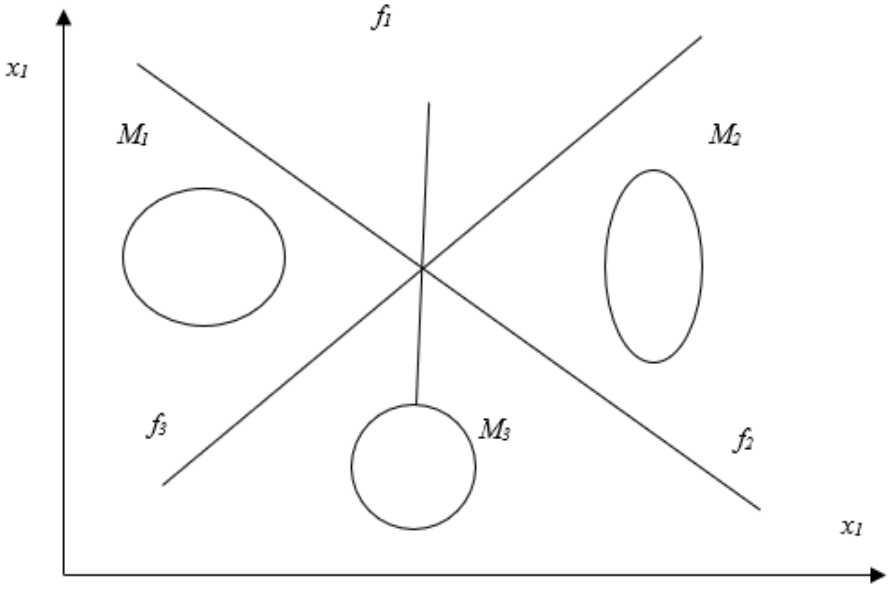
The discrimination rule is chosen according to some principle of optimality based on a priori information. The latter can be presented as information about the functions of the *k*-dimensional distribution of features in each set and the state of samples from these sets. Prior probabilities may or may not be given (Klebanova, Hur'ianova, Chahovets', Panasenko, Serhiienko, Yatsenko, 2020).

Distribution information is represented by samples. The discrimination problem involves: let $x_1^i, ... x_j^i, ...x_n^i$ be a sample from the set φ_i, $i = 1, 2, ..., l$, where each *j*-object is represented by a *k*-dimensional vector of discriminant variables $x_j^i = (x_{jl}^i, ...x_{jq}^i, ..., x_{jk}^i)^T$ $x_j^i = x_{jl}^i, ... x_{jq}^i, ..., x_{jk}^i$. (Klebanova, Hur'ianova, Chahovets', Panasenko, Serhiienko, Yatsenko, 2020).

As a result of the analysis based on the definition of the discrimination function, it is possible to assign a new observation to one of the selected groups.

One of the primary tasks of discriminant analysis is determining the number of classification groups. The geometric interpretation of three samples is presented in Fig. 1.

Figure 1. Discriminant functions for three samples



Source: created by the authors

Our study will divide the sample into three groups, so we rely on such a classification. Thus, it is planned to include nine indicators in the analysis; then, we will assume that nine variables characterize each object: $x_1,\ldots x_9$.

The coefficients of the discriminant function are determined in such a way that these functions differ from each other as much as possible so that the three classes have the maximum expression (Soshnykova, Tamashevych, Uebe, Sheffer, 1999):

$$\overline{f_1}(x) - \overline{f_2}(x) = \sum_{i=1}^{n_1} a_1 x_{1i} - \sum_{i=1}^{n_1} a_1 x_{2i} - \sum_{i=1}^{n_1} a_1 x_{3i} \quad (3)$$

then we should write:

$$f_{kt}(x) - \overline{f_k}(x) = a_1(x_{1kt} - \overline{x}_{1k}) + a_2(x_{2kt} - \overline{x}_{2k}) + \cdots + a_9(x_{9kt} - \overline{x}_{9k}) \quad (4)$$

where k – is the group number.

It is advisable to use the standardized coefficients of the discriminant function to estimate the contribution of a separate variable to the value of the discriminant function:

$$b_j = a_j \sqrt{\frac{w_{jj}}{p-m}} \quad (5)$$

where, p – is the total number of output variables;

m – is the number of groups;

W_{ij} – is the number of objects in the class.

$$W_{jj} = \sum_{k=1}^{m} \sum_{i=1}^{n_k} (x_{ikj} - \overline{x_{kj}})\,(x_{ikj} - \overline{x_{kj}}) \quad (6)$$

where, i – is the observation number;

j – the variable number;

k – the class number;

n_k –is the number of objects in k-class.

Standardized coefficients are used in cases where it is necessary to determine which of the variables contributes the most to the size of the discriminant function (Soshnykova, Tamashevych, Uebe, Sheffer, 1999).

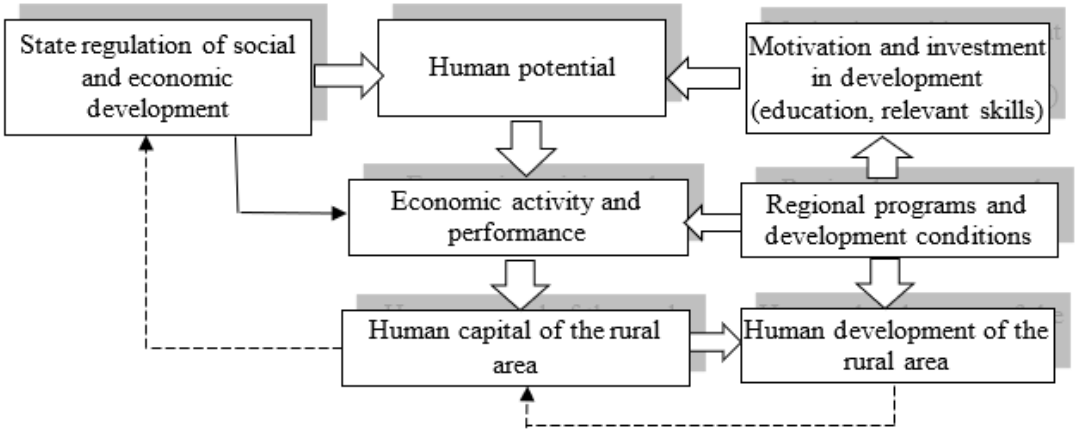
The conclusions of the conducted research were formulated using the methods of abstract specification, generalization, and synthesis of the obtained results.

customer churn modeling Results

Under the conditions of modern global challenges, the development of rural areas should be considered a complex and dynamic phenomenon, the effectiveness of which depends on food security and the population's economic activity. The urgency of these issues is exacerbated by unprecedented challenges for Ukraine and the transformation of the legal field under martial law. Agriculture has become a traditional type of economic activity in the Ukraine countryside, providing employment, income, and agricultural products even under the conditions of the existing military conflict. Due to the development of rural areas, the prerequisites for the formation and restoration of human capital appear, which will contribute to the strengthening of the economic activity of the rural population. Thus, there is a mutually determining relationship between human capital and the development of rural areas, which indicates the similarity of the factors influencing them.

What affects the development of human capital in rural areas? Opportunities and abilities for economic and social activity, as well as for personal growth, are crucial. Favorable conditions for self-development and entrepreneurial training and triggers of the external environment should coincide in the countryside. Such triggers can be state support programs, foreign investments, and economic mechanisms of interest. The process of human capital formation in the rural area is visualized in Fig. 2.

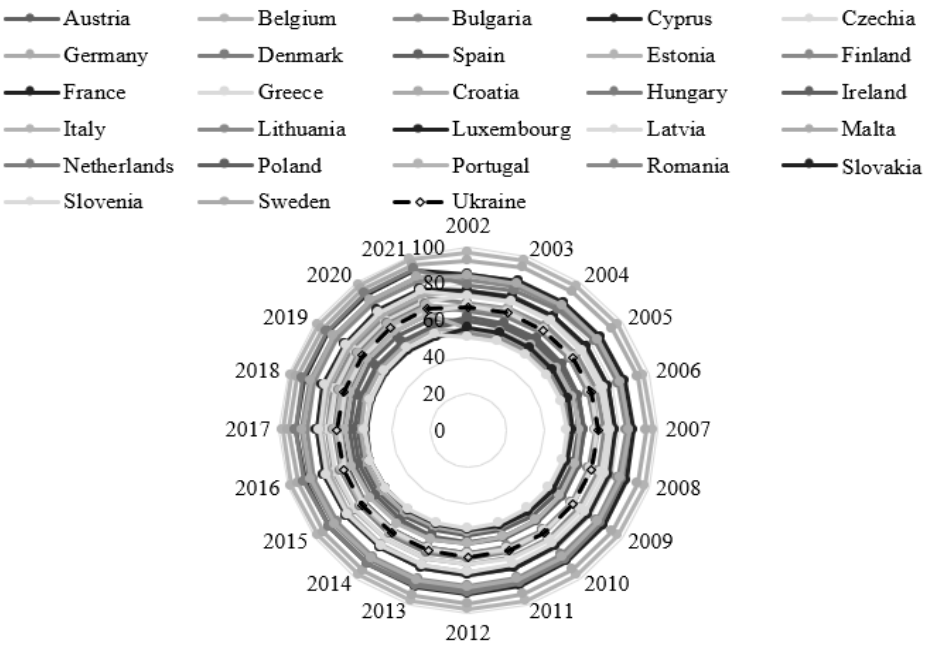
Figure 2. The process of human capital formation in rural areas



Source: created by the authors

As a rule, the state's influence is related to regulating the business environment, educational activities, adjustment of foreign economic policy, and digital transformations. As for the personal, it is people's motivation for economic activity and investments in self-development. If there is no such motivation, then all the prerequisites for urbanization are formed. It is this phenomenon that hinders the development of business in rural areas. The dynamics of the urban population indicator across EU countries (27) for the period 2002-2021 is shown in Fig. 3. also, information about Ukraine is present on the diagram for comparison.

Figure 3. Urban population dynamics in EU countries (% of total population)



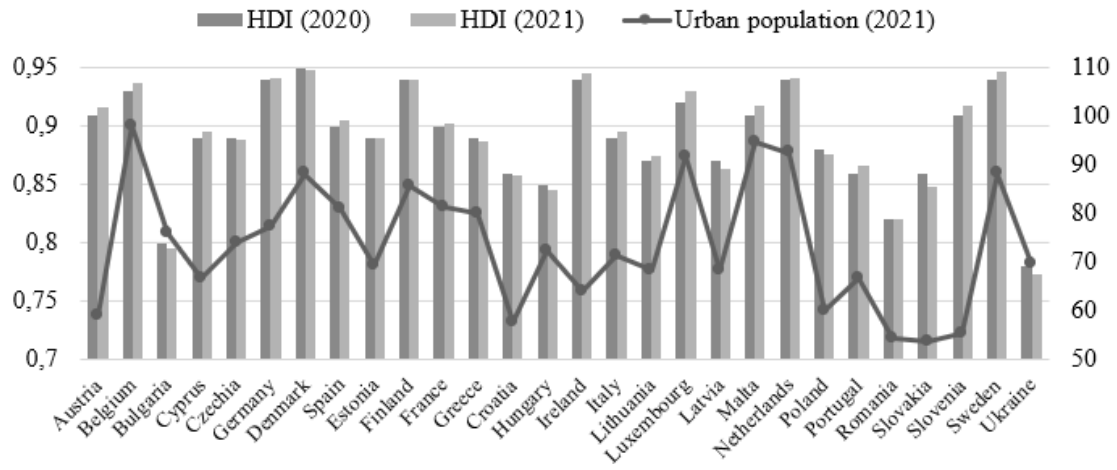
Source: constructed by the authors from the data WORLD Bank

European Union proves that almost all countries either maintain a high level of urbanization for a long time or gradually increase it. The only exceptions were Slovenia and Sweden. Belgium (98%), Malta (95%), the Netherlands (93%), and Luxembourg (92%) have the highest shares of the urban population in 2021. The lowest are Romania (54%), Slovakia (54%), Slovenia (55%), Croatia (58%), and Austria (59%).

When analyzing the significant trends of urbanization, one should also consider the availability of conditions for conducting agriculture and the development of certain types of activities that are characteristic of countries. Thus, in the EU countries, farms are mainly producers of agro-industrial products. Eurostat says the most significant land holdings are in Denmark, France, Sweden, Germany, Italy, Belgium, and Greece. By the way, there is a trend towards an annual reduction in the number of farms in these countries.The biggest problems are costs and changes in climatic conditions, the unfavorable indicators of which reduce the efficiency and predictability of agribusiness. The characteristic feature of the development of farming in these countries is the focus exclusively on meeting food needs. Among the countries of the European Union, an important place in the production of agricultural products (products of animal origin) per capita, according to Eurostat, belongs to Denmark. In total, agricultural land accounts for 40% of all EU land at a time when agriculture has a significant impact on the natural environment in Europe.

As has already been mentioned, the development of rural areas is significantly influenced by human capital. Therefore, it is considered appropriate to overview the human development index achieved in the EU countries and Ukraine (Fig. 4).

Figure 4. The relation between the urbanization indicator and the human development index



Source: constructed by the authors from the data WORLD Bank; Human Development Reports

As shown in Fig. 4, the EU countries have a relatively high human development index (HDI) level. Denmark (0.95), Netherlands (0.94), Sweden (0.94), Germany (0.94), Belgium (0.93), and Malta (0.91) have the highest index. Moreover, in these countries, the indicators of the share of the urban population are also high. The exceptions are Ireland, which has an HDI of 0.94, with 64% of the urban population, and Austria and Slovenia, with high human development (0.91) and a low EU level of urbanization (58% and 55%, respectively).

To assess the level of influence of certain factors of the agricultural business environment on the development of human capital of enterprises in rural areas of Ukraine, available data for 170 countries of the world for 2021 were analyzed (*Source: EUROSTAT, WORLD Bank, World Trade Organization, State Statistics Service of Ukraine*).

The raw data for the analysis were chosen based on the following reasoning. A person, in the presence of organizational and legal conditions in the country and a separate territory, can form motives and opportunities to invest in one's human capital. The following indicators were taken as initial data:

Urban population (% of the total population).

Human freedom.

Index of social progress to reflect such factors in the model.

Economic activity can be determined through the level of employment (%). The possibilities of access to services and information will be reflected through the rating of digital competitiveness.

For many years, the agricultural business has remained one of the most profitable in rural areas. Therefore, its results will be considered in the simulation. Development prospects and the availability of sales markets will be explored by exporting agricultural products per person. Since the strategic goal of any business is the maximization of added value, it will be interesting to study indicators of added value (% of GDP) in the sphere of production and services. The human development index (HDI) is taken as the dependent indicator.

It is necessary to decide on the grouping of the resulting variable (a priori classification) to determine the impact of the nine considered variables on the degree of distribution of the resulting variable. We chose the value of the human development index as the resulting variable. The type was carried out based on assigning the level of the human capital index of an individual country to the interval value between the minimum and maximum value, divided into three groups. Thus, it was determined that the highest level of group A includes countries with the following values: [0.962; 0.775), the average level is group B: [0.775; 0.587), and the low level is group C: [0.587; 0.400].

The following were recognized as independent variables that, according to the hypothesis, can influence the value of the result: the share of the urban population in the total population, the percentage of export of agricultural products per inhabitant of the country, the index of human freedom, the level of employment, the index of social progress, the rating of digital CSP, the share of services in GDP, the percentage of production in GDP. Model construction was carried out using the STATISTICA 8 software package. For analysis, a discrimination method called "stepwise backward analysis" was used, which involves including all variables in the model and gradually removing from it at each stage those that are insignificant to the model.

The main criterion for the quality of discrimination is the Wilks' lambda coefficient, the interpretation of which is as follows: the closer the specified coefficient is to "0", the better the level of discrimination, the closer to "1", the worse. As part of our calculations, the value of Wilks' lambda was obtained at the level of 0.17299, which indicates qualitative a priori discrimination (Halafian, 2007).

The results of the discriminant analysis on independent variables are presented in Table 1.

Table 1. Results of discriminant analysis

Independent variables	Wilks' lambda	Partial lambda	*F*-exclusion criterion	*p*-level of significance of *F*-criterion	Tolerance
Index of social progress (X_1)	0.560100	0.308857	155.5232	0.000000	0.480204
Index of human freedom (X_2)	0.197750	0.874794	9.9473	0.000092	0.13354
Export of agricultural products per 1 inhabitant (X_3)	0.181933	0.950850	3.5925	0.030115	0.826209
Employment level (X_4)	0.175866	0.983650	1.1552	0.317987	0.989805

Source: constructed by authors based on results of model development

Based on the calculations, four variables were left in the model, but one is statistically insignificant according to the *p*-criterion, the level of employment. The Wilks' lambda index, calculated for each independent variable, reflects the degree of importance of including the specified variable in the model. As we can see, the most critical variable turned out to be the index of social progress, which indicates a strong dependence of the resulting class of the country on its value. The tolerance coefficient reflects the degree of redundancy of the corresponding variable in the model as the average share of the variance explained by the variables of the corresponding subset. So, according to the degree of tolerance, the indicator of export of agricultural products per 1 inhabitant is the most influential.

It is necessary to calculate the roots, which explain how our independent changes divide the studied countries of the world into three groups to determine the number of discrimination functions. As a result of the analysis, two roots were obtained, i.e., two potential discriminant parts, the significance of which is presented in Table 2.

Table 2. Sequential significance criterion for canonical roots

Number of roots	Eigenvalue	Value of canonical correlation	Wilks' lambda	χ^2-criterion	Degree of freedom	*p*-level of significance of χ^2- criterion
1st and 2nd	4.214232	0.899009	0.179076	232.1923	6	0.000000
2nd	0.070956	0.257399	0.933746	9.2544	2	0.009782

Source: constructed by authors based on results of model development

The first line displays the value when both roots are present, and the 2nd line after removing the 1st (Soshnykova, Tamashevych, Uebe, Sheffer, 1999). Despite the level of the *p*-criterion, the influence of the second function is minimal, which is confirmed by the high value of Wilks' lambda (0.934) and the low eigenvalue (0.071).

Analysis of the roots requires the study of the coefficients of the canonical variables (Table 3):

Table 3. Characteristics of the contribution of the studied variables to discrimination

Independent variables	Standardized coefficients of discriminant functions		Factor structure	
	Function 1	Function 2	Function 1	Function 2
Index of social progress (X1)	1.347919	0.499848	0.908659	-0.364903
Index of human freedom (X2)	-0.541493	-0.772278	0.352218	-0.681798
Export of agricultural products per 1 inhabitant (X3)	-0.147079	-0.786355	0.231678	-0.834048
Characteristics of the contribution of each function to discrimination				
Eigenvalue	4.214232	0.070956	-	-
Cumulative share of explained variance	0.983442	1.000000	-	-

Source: constructed by authors based on results of model development

Based on the analysis results, it can be outlined that the index of social progress has the most significant contribution to the discrimination of the first function and the export of agricultural products per 1 inhabitant and the index of human freedom to the second function. According to the value of the cumulative share of variance, the first function covers 98.34% of all explained variance, which indicates its absolute priority and overall "sufficiency" for describing the spread of values between groups.

The provided factorial structure reflects intragroup correlations of variables with the corresponding discriminant functions – structural coefficients. The spread of these values is much smaller than the coefficients of the discriminant functions. Still, the first function also has the highest correlation with the social progress index and the second one with the export of agricultural products per 1 resident.

Calculating average canonical variables allows us to determine which of the selected groups are best classified by the 1st or 2nd function according to the level of the human development index (*see Table 4*).

Table 4. Characteristics of the contribution of the studied variables to discrimination

Groups	Function 1	Function 2
A	1.94913	-0.149178
B	-0.46206	0.363730
C	-3.30432	-0.261543

Source: constructed by authors based on results of model development.

As we can see, the 1st function best classifies group A, countries with the highest level of the resulting characteristics, and group C, with the lowest – accordingly, the 2nd function best ranks group B, countries with an intermediate value.

The graphic interpretation of the conducted discriminant analysis is presented in Figure 5.

As we can see, a precise distribution of observations is observed throughout the first function, which confirms its potent discriminant property, which is not typical for the second function, where we see a significant clustering of observations opposite similar values.

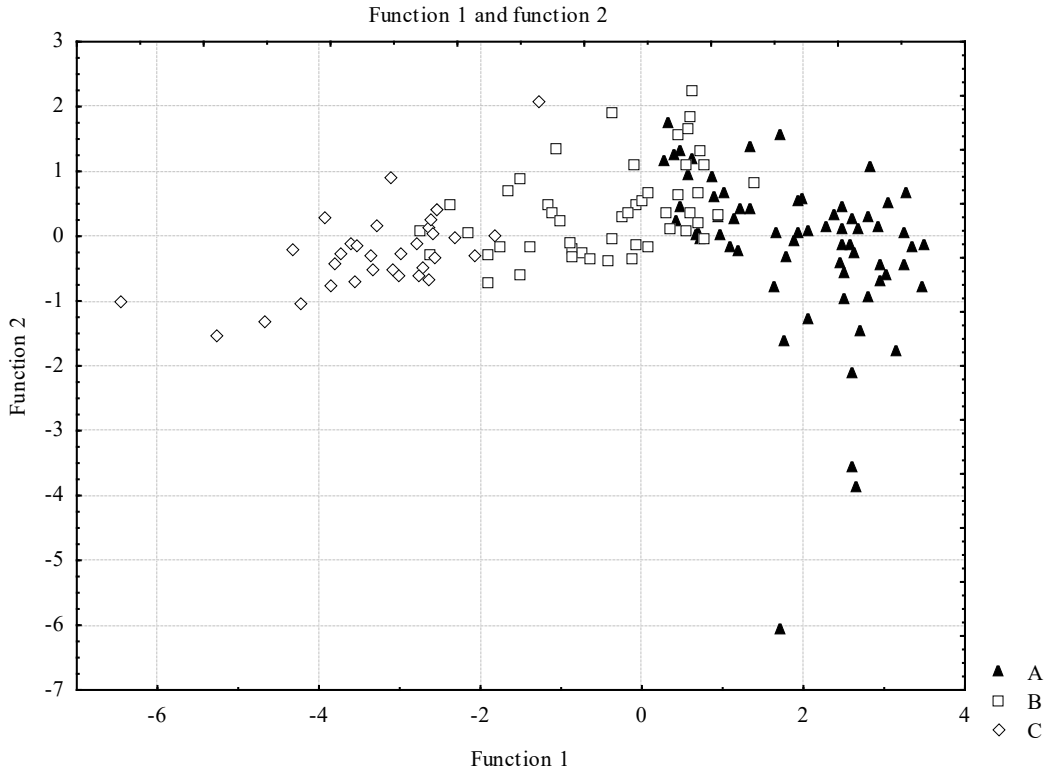
As a result, the classification function assigning each observation to the appropriate group will be as follows:

$$A = 2.1833X_1 + 0.013X_2 - 3.4537X_3 \quad (7)$$

$$B = 1.7248X_1 + 0,9764X_2 - 3.118X_3 \quad (8)$$

$$C = -3.4537X_1 - 3.489X_2 - 2.825X_3 \quad (9)$$

Figure 5. Distribution of values of discriminant functions



Based on the calculations, we determined the parameters of the classification function of the studied objects, grouped by the level of the human development index, depending on the contribution of independent variables to discrimination: the index of social progress (X2), the index of human freedom (X2) and the export of agricultural products per 1 inhabitant (X3). The index of social progress has the most significant influence on the distribution of countries, which allows us to claim that this indicator indirectly affects human development in countries.

The index of human freedom and the export of agricultural products per 1 inhabitant has a much smaller influence – the distribution of these indicators is similar. On the other hand, the highest level of tolerance is observed for the last indicator, which indicates that this indicator explains the largest share of dispersion within the groups – the unevenness of foreign economic activity of agrarians explains the value of the parameters.

5. DISCUSSION

The results of the conducted research leave specific debatable points related to the state policy of developing rural areas based on the principles of inclusiveness. There are the most significant gaps in Ukraine between rural and urban areas of both socio-economic and infrastructural origin. The same holes are also characteristic of individual regions of Ukraine, which ultimately

causes different levels of involvement of areas in economic and social activities. The conducted research made it possible to identify the critical problems of the existing gaps (in income, education, logistics costs, territorial remoteness, etc.), so the issue of implementing the toolkit for regulating rural development programs, taking into account the European integration vector of Ukraine, can become a promising direction. The guideline obtained from the simulation to ensure the growth of human capital development through export and innovative activity of farmers in the current conditions of martial law in Ukraine becomes complicated. It can be fully implemented in the post-war period.

Implementation of models for forecasting the development of human capital in rural areas allows early identification of determinants and gaps in the level of involvement of regions in economic and social activities. In this regard, further studies may contain justifications for appropriate tools for agribusiness regulation, considering relevant factors and global challenges. The authors believe such studies should be based on alternative rural development strategies. The specifics of the connection between agriculture and business entities of other industries as a basis for the development of the rural area also require a separate analysis.

6. CONCLUSIONS

The conducted research showed that the policy adopted in the state to ensure the development of rural areas based on the principles of inclusiveness should be based on balanced tools, methods, and levers capable of minimizing external and internal threats to agribusiness. People's opportunities and abilities for economic and social activities and their development are crucial. The determining factor in this process should be human capital, from which the prerequisites for developing rural areas will be formed. In this context, the upward dynamics of the indicator of the urban share population in the EU countries was analyzed and revealed, which may hinder the development of businesses in rural areas. Emphasis is put on the prospects of small businesses in rural areas, particularly in the post-war period. The authors studied the relationship between the urbanization indicator and the human development index in Ukraine and the EU countries. Based on this, the list of threats and determinants of human development in rural areas is summarized:

1) inequality (in income, access to social benefits, and digital technologies);

2) infrastructural combination of regions (remoteness, complex and costly logistics);

3) uneven placement (predominant urbanization, business relocation, investment programs of territorial development);

4) motivation for development (access to education, innovation, exchange of experience, overcoming unemployment through self-employment).

The proposed assumption regarding the composition of factors for the development of human capital in rural areas was also verified based on statistical data from 170 countries of the world. The conducted analysis and built model of discriminant analysis of the influence of the considered independent variables on the grouping of the values of the resulting change - the index of human development - made it possible to reject the hypothesis of the existence of a direct relationship between the level of development of rural areas and human development in general, using generally recognized quantitative indicators. As we can see, most of the primary indicators that quantitatively reflect the level of development of rural areas, such as the share of the urban population, the level of employment, and the percentage of products and services in the GDP structure, were not included in the model at all, which indicates that there is no

connection between the spread of these values and resulting feature. Among the considered indicators, only the level of agricultural export activity affects the human development index due to discrimination, which allows us to assert the existence of dependencies between these indicators, which is mainly related to the introduction of innovations in agricultural activities, the sources of financing of which are often revenues from foreign economic activities. The high level of innovative activity of agrarians affects the organization and way of life of the rural population, ensuring an increase in its level of well-being and, as a result, contributing to the growth of human capital development.

Such scientific results prove the priority of state support for innovative and export agriculture activities in Ukraine, considering the need to ensure the development of the human potential of residents of rural areas. These measures will become the basis of the successful implementation of the strategy of European integration. The similarity of the state policy orientation of leading foreign countries and Ukraine on progressive changes in agriculture, the formation of drivers and sources of investment, which is essential when establishing ties regarding international co-operation, and the implementation of agricultural legislation, is also proven. Therefore, the program supports the innovative activity of business entities, which requires both the improvement of innovative infrastructure in the state and the further improvement of projects to implement innovative ecosystems of the national and interstate levels of support.

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RESEARCH ON THE ANALYSIS AND IMPACT OF INTERNET CELEBRITY ECONOMY ON CONSUMERS' IRRATIONAL BUYING BEHAVIOR IN THE BIG DATA ENVIRONMENT

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ABSTRACT

In the context of big data, the internet celebrity economic marketing model has gradually become one of the mainstream online marketing models. Internet celebrities use their special influence and characteristics of the times to bring revolutionary changes to product promotion. This phenomenon carries more economic value and has significant social impact. At the same time, the development of the Internet celebrity economy has triggered concerns that irrational consumer behaviour may disrupt the e-commerce market. This paper investigates the influence of the Internet celebrity economy on consumers' irrational purchase behaviour in this environment. To do so, the K-means clustering method is utilized to collect data on both internet celebrity economies and consumers' irrational buying behaviour. The study develops a research model with the independent variables of internet celebrities' professional degree, credibility, and fan attraction, and the dependent variable of consumers' buying behaviour, with consumers' buying sentiment serving as an intermediary variable. The empirical analysis demonstrates that the Internet celebrity economy significantly impacts consumers' irrational purchase behaviour, with higher levels of professionalism, credibility, and fan attraction among internet celebrities associated with greater likelihoods of irrational consumer purchasing. Based on these findings, two strategies are proposed to mitigate irrational purchasing behaviour: improving the professional quality of internet celebrities and promoting rational consumer buying practices.

Keywords: *Big data environment, Internet celebrity economy, consumer, Irrational, purchase behaviour, Dependent variable*

1. INTRODUCTION

In the environment of big data, online information is filled with all aspects of people's life, which is characterized by large amount of data and high dimension (Seger-Guttmann, 2019; Siyal et al., 2021; Wu, 2021; Moraliyska, 2023) . Rapid innovation in the online field has led to more development. Since social software is ubiquitous in people's lives, self-media platforms have developed rapidly. (Hedid and Abdessamad, 2020), and has become an important channel for e-commerce capital. With the increase in capital, people's shopping methods have also shifted from traditional offline shopping to online shopping. This shopping method can better meet consumers' personalized shopping needs and has the characteristics of diversity and portability (Abdelsalam et al., 2020; Parfenova and Romashova, 2020; Sloot, 2021; Matviienko-Biliaieva

et al., 2023). Online delivery on self-media platforms has also become a new way for people to purchase products through the Internet (He et al., 2021; Tsao et al., 2019; Shevchenko, 2023). Rohanaraj, (2023) found that cultural and social factors have a useful influence on consumer purchasing behavior towards consumer products. With the rapid rise of the Internet celebrity live broadcast industry, the concept of "Internet celebrity economy" came into being. This is a process dominated by Internet celebrity vision, gathering popularity on social networks, and conducting precise marketing to fan groups. , and convert fans into purchasing power (An, 2021; Chowdhury, 2019; Sama, 2019). However, when consumers purchase products, they are easily affected by the Internet celebrity economy and cannot judge the quality of the product through mature and rational consumption concepts. In addition, due to the strong subjectivity of the Internet celebrity economy, consumers are easily affected by bad customs, resulting in irrational purchasing behavior (Brzozowska-Woś and Schivinski, 2019).

At present, many scholars have carried out researches in this field and obtained certain achievements. Zuo and Pan, (2021) studied the impact of the marketing model of "Internet celebrity economy" on college students' consumption behavior. Starting from the four variables of media image, precision marketing, interactive communication and niche circle, the structural equation model is used to study. It is found that precision marketing and the promotion of minority circles will promote the actual consumption behavior of college students, while the influence of media image and interactive communication is not significant, indicating that college students are more likely to generate consumption desire from personalized recommendation marketing, but have little correlation with the specific image of Internet celebrities. However, this method has some limitations on the research group, and it is difficult to reflect the overall behaviour characteristics of consumers. From an empirical perspective, Jiang, (2019) studied and analyzed the influencing factors of live streaming on consumers' purchasing decisions under the Internet celebrity economy. SPSS 24.0 was used for descriptive statistics, reliability analysis, validity analysis, correlation analysis and regression analysis. AMOS 25.0 was used to draw the structural equation model, and the degree of fit of the model was tested. It is found that the personal charm, credibility and interaction intensity of Internet celebrities can have a positive impact on consumers' cognitive attitude and emotional attitude, and consumers' cognitive attitude and emotional attitude will positively affect consumers' purchasing decisions. This method focuses on the role of live streaming in the economy of Internet celebrities, and the conclusion obtained has certain limitations.

From the perspective of flow experience, Xin, (2021) studied the impact of internet celebrities' live marketing on consumers' impulse buying intention. Determine the three typical dimensions of the characteristics of Internet celebrities, namely credibility, professionalism and interactivity, and the two typical dimensions of live broadcasting situation, namely incentive mechanism and atmosphere clues. Based on the "stimulus-organism - response (S-O-R) theory", a three-stage model of "Internet celebrity characteristics and live streaming situational characteristics -- flow experience -- impulsive purchase intention" was constructed, and empirical analysis was conducted with SPSS 24.0 and AMOS 25.0. It is found that both the characteristics of Internet celebrities and the situation of live broadcasting are positively correlated with consumers' impulsive purchase intention. This method starts from the characteristics of Internet celebrities and the situation of live broadcasting to analyze, which has certain subjectivity, resulting in certain one-sidedness of the results.

Based on this, this paper takes the big data environment as the research background to analyze the impact of Internet celebrity economy on consumers' irrational purchasing behaviour. This paper analyzes consumers' browsing and search records of commodities under the influence of

Internet celebrity economy, and obtains consumers' irrational purchasing behaviours, so as to provide an effective basis for promoting the further development of Internet celebrity economy.

2. ESTABLISHMENT OF THEORY AND MODEL

2. 1. INTERNET CELEBRITY ECONOMY

With the enhancement of data informatization, there are more and more network celebrities with certain popularity and certain scale of fan groups on the network. They transform fan groups into consumer groups through brand promotion or marketing, so as to drive the network consumption. Network economy is a social and economic phenomenon in which network celebrities convert their traffic into fans' purchasing behaviour (Geng et al., 2020; Sevillano et al., 2019; Zhao et al., 2020), transforming online celebrities' traffic into fans' purchase behaviour. At present, there are many new-generation Internet celebrities in the Internet, and Internet celebrities make full use of self-media platforms to drive consumers' purchase behaviour through their own advantages. In recent years, internet celebrity's economy has been driven by the power of capital (Hendra and Kaihatu, 2019; Hwang and Nam, 2021; Li et al., 2021), and many internet celebrity use big data environment to carry out various promotion and marketing activities to enhance their commercial value.

Internet celebrity economy, webcast and advertising promotion are important operation modes of Internet celebrity economy at present. The above three operation modes may drive consumers' consumption behaviour and make consumers form purchase intention (Calvo-Porral et al., 2021; Haryanto et al., 2019; Liang et al., 2020).When internet celebrity live broadcast is adopted to recommend products to consumers in internet celebrity economy, live scenes can be set up according to the products to be recommended (Almuraqab, 2021; John and Dani, 2021; Ma and Bardai, 2021) to attract more consumers to form their desire to buy products.

2. 2. DATA COLLECTION

In order to further study the impact of Internet celebrity economy on consumers' irrational purchase behaviour under the big data environment, the big data collection of consumers' irrational purchase behaviour is the data basis of the research (Lewin et al., 2020; Lv et al., 2020; Nosi et al., 2020). The empirical analysis to study groups for consumers, but consumers still can be subdivided into various categories, in order to guarantee the objectivity of the results of the study, in the process of data collection, the entire consumer groups can be divided into adolescent consumers, college students and adult consumers, this article selects have independent life ability and fixed economic sources of adult consumers as the research object. The behaviour data of consumer groups are randomly selected from the network database from December 2022 to May 2023 to form the sample data of this empirical analysis. In the process of data collection, K-means clustering method is mainly used, and the specific process is as follows.

The expression of the K-means clustering objective function for collecting the irrational purchasing behaviour data of internet celebrity economy and consumers by K-means clustering method is as follows:

$$J = x_{i\min} + \alpha x_i \left(x_{i\max} - x_{i\min} \right) \tag{1}$$

In formula (1), and respectively represent the classification weight index and the collected vector in the big data set of internet celebrity economy and consumers' irrational buying behaviour; $x_{i\max}$ and $x_{i\min}$,the maximum and the minimum search radius for collecting big data of internet celebrity's economy and consumers' irrational buying behaviour are respectively

indicated.

In the big data collection process of Internet celebrity economy and consumer irrational buying behaviour, the attenuation of the big data collection channel has second-order homogeneity. The spatial beamforming method is used to obtain the clustering global kernel function expression of big data collection of internet celebrity economy and consumers' irrational buying behaviour as follows:

$$H = a_0 + \sum_{i=1}^{M} a_i x_{n-i} \tag{2}$$

In formula (2), x_{n-i} and a_0 represent the number of samples with the same variance and mean value and the sampling amplitude of the mixed kernel function of big data of initial internet celebrity economy and consumers' irrational buying behaviour respectively.

The final objective function expression for acquiring big data of Internet celebrity economy and consumers' irrational purchase behaviour is as follows:

$$J = \min \frac{1}{2}\|c\|^2 + H\sum_{i=1}^{n}\left(\xi_i + \xi_i^*\right) \tag{3}$$

In formula (3), ξ_i、ξ_i^* represent a non-negative relaxation variable. Convergence rate of beam directivity weighted big data acquisition (Baghestani and Viriyavipart, 2019; Xhema, 2019) Map the collected big data of internet celebrity economy and consumers' irrational buying behaviour to $[W_{\min}, W_{\max}]$ section, the update expression for collecting big data of internet celebrity economy and consumers' irrational buying behaviour is as follows:

$$W(t) = W_{\min} + (W_{\max} - W_{\min})W(t) \tag{4}$$

In formula (4), $[W_{\min}, W_{\max}]$ indicates the threshold value range of collecting big data of Internet celebrity economy and consumers' irrational purchase behavior in the big data environment. In order to improve the convergence speed of big data collection related to the Internet celebrity economy and consumer irrational buying behavior under the big data environment (Lei et al., 2020; Xie and Karan, 2019),The fitness function is added to the process of collecting big data, and the punishment learning in the process of collecting big data related to internet celebrity economy and consumers' irrational buying behaviour is realized through the fitness function.

2. 3. CONSTRUCTING THE RESEARCH MODEL

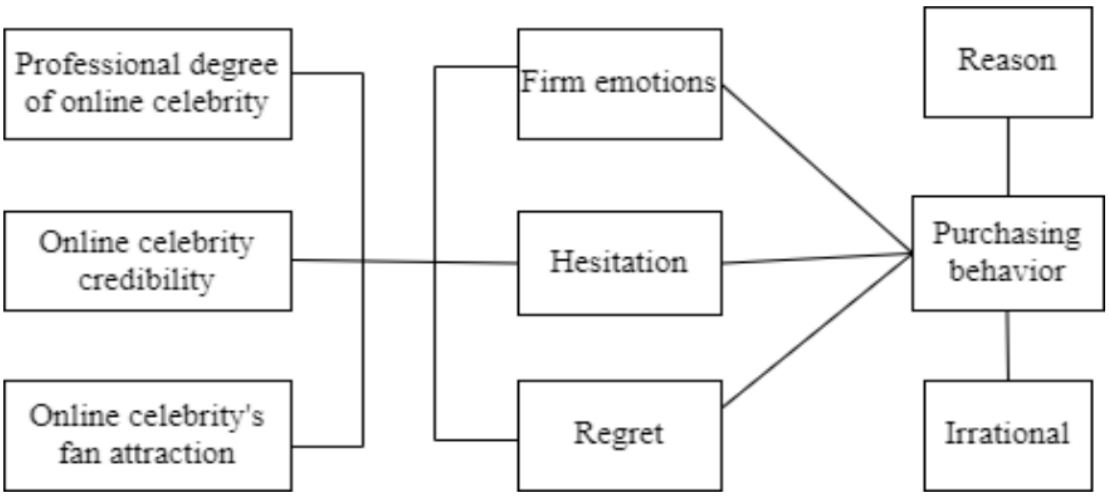
Consumers' purchasing mood can reflect the rational degree of consumers' consumption behaviour. When consumers shop rationally, their buying mood is usually firm; When consumers shop for irrationality, their buying mood is usually accompanied by regret and hesitation. Consumers' purchase emotion is controlled by personal will. As an emerging economic model, Internet celebrity economy can transmit information in a low-cost way across space and time. The Internet celebrity economy has developed rapidly in a short period of time (Kang and Amornstira, 2020; Li et al., 2020; Wang et al., 2020), and it has become an important economic mode in my country. There are many advantages in the economic development of Internet celebrities.

The Internet celebrity economy is an important economic model that relies on the relationship between the Internet celebrities themselves and their fans. The entry threshold of internet celebrity's economy is low, and the network economy has high development potential and growth space. Because internet celebrity's economy is in the early stage of development, the government has formulated many improvement measures to improve internet celebrity's economy (Lee et al., 2021), improve internet celebrity's economy and ensure the sustained and healthy development of internet celebrity's economy. The Internet celebrity economy is an important

economic way to promote consumer purchase behaviour. Fans are more willing to buy products recommended by the Internet celebrity through trust in the Internet celebrity. Internet celebrity economic marketing methods are more efficient in disseminating advertisements. Fans are more willing to watch ads recommended by them based on their trust in internet celebrities. Fans' trust in internet celebrities is an important basis for internet celebrity economy to drive consumer purchase behaviour. Fully considering the big data environment, this paper explores the influence of internet celebrity's economy on consumers' irrational purchasing behaviour, and clarifies the important mechanism that individuals are influenced by internet celebrity's economy on purchasing behaviour (Zhao et al., 2019). Through the research results, it provides relevant strategies for improving internet celebrity's economic development and avoiding consumers' irrational purchasing behaviour.

Based on the above analysis and the reference of existing research results, in the empirical analysis, this paper focuses on the research of Internet celebrities' professionalism, trustworthiness and fan attraction, and takes consumers' firm emotion, hesitation emotion and regret emotion as the main variables of consumers' irrational purchase behavior. The research model of Internet celebrity economy and consumers' irrational purchasing behavior under the environment of big data is shown in Figure 1.

Figure 1. Research model



Source: Author's scheme

As can be seen from Figure 1, the three factors of the professionalism, trustworthiness and the attraction of Internet celebrities and their fans will all have an impact on consumers' buying emotions. If the professional degree of Internet celebrities is insufficient, it will lead to problems in the process of selling products; If its credibility is not high, it will affect the impression of consumers on it, and then make consumers suspicious of the goods sold by it; If it is difficult for internet celebrities to attract the attention of fans, consumers may think that the goods they sell are not worth buying. All these situations will affect consumers' emotions in the process of purchasing commodities, making them difficult to firmly choose the commodities recommended by Internet celebrities, hesitant to buy commodities, and regretful after buying commodities on impulse. These emotions determine consumers' rational purchase. Internet celebrity's professionalism, credibility and appeal to fans are important variables of internet celebrity's economy driving consumers' buying behaviour under the big data environment. The above three internet celebrity characteristics are set as independent variables of the research model

of internet celebrity's economy and consumers' irrational buying behaviour under the big data environment. Set consumer purchase as the dependent variable of the model, and set consumer purchase sentiment as the intermediary variable.

3. EMPIRICAL ANALYSIS

Using the data collection method of consumers' irrational buying behaviour in big data environment, this paper collects the related data of internet celebrity economy and consumers' irrational buying behaviour in big data environment, analyzes the consumption records of consumers under the influence of internet celebrity economy in big data environment, and obtains consumers' irrational buying behaviour. After the stage of data collection, in this paper, the total to 600 consumers irrational purchase behavior data, the data collected, the consumers are already work independently, have a fixed source of income of adults, aged 23 years of age or older, level of education for the university undergraduate course graduation, engaged in all walks of life, the average monthly salary is RMB 5462. SPSS 24.0 data processing software was used to process and analyze the sample data, so as to know the influence of Internet celebrity economy on irrational purchasing behavior of consumers under the environment of big data. The specific statistical analysis process is shown as follows.

3. 1. DESCRIPTIVE STATISTICAL ANALYSIS

Based on the research model of Internet celebrity economy and consumers' irrational purchasing behaviour constructed above, descriptive statistical analysis is carried out on each variable in the model, and the results are shown in Table 1.

Table 1. Results of descriptive statistical analysis

Variable	Average value	Standard deviation
Internet celebrity professional degree	3.284	0.754
Internet celebrity credibility	3.485	0.581
Fan attraction of influencers	3.648	0.645
Firm emotions	3.875	0.584
Hesitation	3.645	0.496
Regret	4.155	0.597
Rational buying behaviour	4.256	0.863
Irrational buying behaviour	3.894	0.841

Source: Author's data

From the results of the descriptive statistical analysis in Table 1, it can be seen that the average value of the research variables of the established internet celebrity economy and consumer irrational buying behaviour research model is between 3.5-4.5, and the standard deviations of the variables are all less than 1.The results of descriptive statistical analysis show that the constructed Internet celebrity economy and consumer irrational buying behaviour research model has a good overall distribution and centralization trend, which can realize an effective analysis of consumer irrational buying behaviours in the Internet celebrity economy under the big data environment .

3. 2. TRUST LEVEL ANALYSIS

Confirmatory factors were used to verify the reliability of variables in the research model of Internet celebrity economy and consumer irrational purchasing behaviour, so as to verify the validity and scientificity of the model variables. The reliability test results of the research model of Internet celebrity economy and consumers' irrational purchasing behaviour are shown in Table 2.

Table 2. Reliability test results

Measurement variables	Cronbach's coefficient α	Significance test results
Internet celebrity professional degree	0.854	0.000
Internet celebrity credibility	0.815	0.000
Fan attraction of influencers	0.915	0.000
Firm emotions	0.856	0.000
Hesitation	0.943	0.000
Regret	0.982	0.000
Rational buying behavior	0.852	0.000
Irrational buying behavior	0.908	0.000

Source: Author's results

The reliability test results in Table 2 show that the SPSS 24.0 software is used to implement exploratory factor analysis on the research model of Internet celebrity economy and consumer irrational buying behavior under the big data environment. The results of Cronbach's α coefficient of each variable are all higher than 0.8.When Cronbach's o value is higher than 0.7, it means that the model has high internal reliability. The significant results of reliability test of the research model of irrational purchasing behaviour of economy and consumers in internet celebrity are 0.000. The reliability test results verify that all variables can meet the reliability requirements. Under the big data environment, all the variables of the research model of internet celebrity economy and consumers' irrational buying behaviour have high reliability, which proves that the reliability of the variables in this empirical analysis is good.

3. 3. VALIDITY ANALYSIS

The accuracy of empirical measurement data can be tested by validity. In order to ensure the data consistency between the Internet celebrity economy and the research model of consumers' irrational purchase behavior, the validity of data collected by big data technology is counted, and AMOS 25.0 software is used to conduct confirmatory analysis on the data of consumers' irrational purchase behavior collected by big data technology, The results of validity analysis are shown in Table 3.

Table 3. Results of validity analysis

Index		Inspection results
KMO value		0.952
Bartlett Spherical test	Approximate chi square	2845.64
	Chi square degree of freedom ratio/df	532
	Significance test results	0.000

Source: Author's results

From the results of the validity test in Table 3, it can be seen that the overall KMO value of the research model of the Internet celebrity economy on consumers' irrational buying behavior in the big data environment is 0.952, and the significance analysis result is 0.000. When the KMO value is higher than 0.6, the designed model is considered to have high validity. The validity test results show that the research model of internet celebrity's economy and consumers' irrational buying behavior under the big data environment can meet the validity test, and can be applied to analyze the influence of internet celebrity's economy on consumers' irrational buying behavior.

3. 4. CORRELATION ANALYSIS

The correlation between variables in the research model of consumer irrational purchase behavior is analyzed, and the analysis results are shown in Table 4.

Table 4. Correlation analysis results

	ICP	ICC	FAI	FE	Hesitation	Regret	RBB	IBB
Internet celebrity professional degree（ICP）	1							
Internet celebrity credibility (ICC)	0.584***	1						
Fan attraction of influencers (FAI)	0.651***	0.578***	1					
Firm emotions (FE)	0.862***	0.645***	0.484***	1				
Hesitation	0.645***	0.854***	0.615***	0.851***	1			
Regret	0.518***	0.546***	0.648***	0.846***	0.915	1		
Rational buying behaviour (RBB)	0.688***	0.865***	0.945***	0.645***	0.567***	0.587***	1	
Irrational buying behaviour (IBB)	0.865***	0.758***	0.856***	0.647***	0.845***	0.567***	0.648***	1

Source: Author's results

It can be seen from the correlation test results in Table 4 that when the significance level is lower than 0.01, there is a significant positive correlation between the variables of the Internet celebrity economy research model on consumers' irrational buying behavior in the big data environment, verifying the big data environment The Internet celebrity economy has a very high relevance to consumers' irrational buying behavior.

As can be seen from the correlation analysis results in Table 4, in the big data environment, there is a significant correlation between Internet celebrity economy and consumers' irrational purchasing behavior, indicating that Internet celebrity economy can influence consumers' irra-

tional purchasing behavior. From the perspective of the characteristics of Internet celebrities, if the Internet celebrities have a high degree of professionalism and credibility, they are more likely to attract consumers. After being attracted, consumers will buy products in a happy mood. With the increase of consumption times, irrational purchasing behavior will inevitably occur. From the perspective of consumer emotion cognition, if the consumer hesitates and regrets, it means that the consumer has irrational purchase behavior. On the contrary, if the purchase emotion is relatively firm, it means that the consumer's purchase behavior belongs to the rational purchase behavior.

4. CONCLUSIONS

In the context of big data, we media platform develops rapidly, providing a broader development space for Internet celebrity economy. However, Internet celebrity economy, as a new way of Internet marketing, not only brings new opportunities for product sales, but also increases the irrational purchasing behavior of consumers. In order to help consumers to avoid irrational purchasing behaviour and achieve a win-win situation between consumers and sales enterprises, the influence of Internet celebrity economy on irrational purchasing behavior of consumers was studied. The empirical results show that in the environment of big data, when the degree of professionalism, trustworthiness and attraction of Internet celebrities to fans are high, the irrational purchasing behavior of consumers increases significantly. If the consumer hesitates and regrets, it means that the consumer has irrational purchase behavior. In order to avoid the occurrence of consumers' irrational purchasing behavior, the following strategies are proposed:

(1) Enhance the moral quality and professional ability of Internet celebrities. Make the net red establish the correct values and consumption concept, promote the brand and products within a reasonable range, have a certain understanding of the products sold, avoid excessive publicity, and actively safeguard the legitimate rights and interests of consumers;

(2) We media platform guides consumers to make rational purchases. Strictly supervise the process of internet celebrities selling products live, timely remind consumers when internet celebrities are over marketing, so that consumers are passive and calm, and avoid impulse consumption.

Through the above process and conclusion of the empirical analysis, to the big data environment conduct the thorough research to the red net economic development, to avoid the buying behavior of consumers irrational put forward the corresponding strategy, looking forward to relevant government departments to raise concerns about the field, and put forward the policy of more targeted, make consumers in the future, with the further development of the web celebrity economy, Able to stay sober and calm, rational consumption.

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A SYSTEMATIC LITERATURE REVIEW ON THE TRANSFORMATION OF ENTREPRENEURIAL INTENTION TO ENTREPRENEURIAL ACTION

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ABSTRACT

Transformation of entrepreneurial intention to action is a relatively new field of research that has attracted considerable interest from researchers over the past decade. This literature review has endeavoured to systematise and categorise the past studies to comprehend their actual research focus. The study has used 65 articles published between 1981 – 2020, divided into two categories, as articles published between 1981- 2000 and 2001 – 2020. This study has used PRISMA framework, with well-defined exclusion and inclusion clauses, to identify relevant articles. The review found psychosocial influence to be the major focus of entrepreneurship research during year 1981-2000 period, while entrepreneurial mindset, entrepreneur's family background, gender, behavioural control and entrepreneurial eco system, to be the major focus of the studies conducted between year 2001 and 2020. This review also found quantitative research methodology to be more popular among entrepreneurship researchers with regression analysis and structural equation modelling being most preferred for data analysis. This study has identified University students to be the most preferred unit of observation, while nascent entrepreneurs were found to be the least preferred. The study has also identified intention-action transformation to be a relatively new field of study with the field only gaining momentum over the past decade. This study adds value to the existing literature, through systemization and categorization, while supporting the administrators, policymakers, universities, and future researchers.

Keywords: *Entrepreneurial intention, Entrepreneurial action, Intention-action transformation, Entrepreneurial mindset, Entrepreneurial Eco System, Systematic Review*

1. INTRODUCTION

Entrepreneurship is identified to be an effective tool in managing economic and unemployment related problems of a nation. It has the potential to support countries towards productivity improvement through effective product/ market revitalization (Guerrero, Rialp & Urbano, 2012). Many countries have acknowledged entrepreneurship as a useful tool for tackling their economic and social challenges (Ozaralli & Rivenburgh, 2016). This has resulted in many countries investing heavily on developing the required infrastructure, to encourage the new and aspiring entrepreneurs, to transform their entrepreneurial intention to action. However, the tremendous amount of time and effort invested by many of the countries, have only resulted in limited suc-

cess, with the rate of transformation continuing to remain below the expectations (Ozaralli & Rivenburgh, 2016; Rohanaraj, 2022).

Majority of studies conducted in the past have considered the transformation of entrepreneurial intention to entrepreneurial action to be a directly correlated process (Vlasenko, 2023; Kushnir et al., 2023; Rohanaraj, 2023; Puška et al., 2018; Joensuu et al., 2013; Krueger et al., 2000). This premise expects higher level of entrepreneurial intention to result in higher rate of action. With this assumed correlation in mind, majority of the studies conducted during the period under consideration (1981 – 2020), have focused on entrepreneurial intention and the characteristics directly related to the potential entrepreneur (Kibler, Kautonen & Fink, 2014; Weiss, Anisimova & Shirakova, 2019; Maia & Frogeri, 2023; Biliavska et al., 2022).

However, practical insights from multiple countries have shown that such a premise is over-optimistic and not real (Nozharov & Hristozov, 2023; Reynolds & Curtin, 2009). This observation related to over-optimism is also supported by the studies conducted by researchers such as, Linan & Foyale, (2015), Shirakova et al. (2016), Van Gelderen et al. (2015) and Zahra (2007) as well. Their studies showed that entrepreneurial intention may not necessarily result in enterprise creation, due to the influence of many other factors (Kuzmak & Kuzmak, 2023; Shemshad & Karim, 2023; Puška et al., 2020; Reynolds & Curtin, 2009).

Though different from the traditional belief, this view on the influence of various factors has started gaining momentum over the past decade, with more researchers focusing on this relatively new field of research. This change of focus makes it necessary for a detailed review of the available literature, so that they could be systematised and categorised for effective learning.

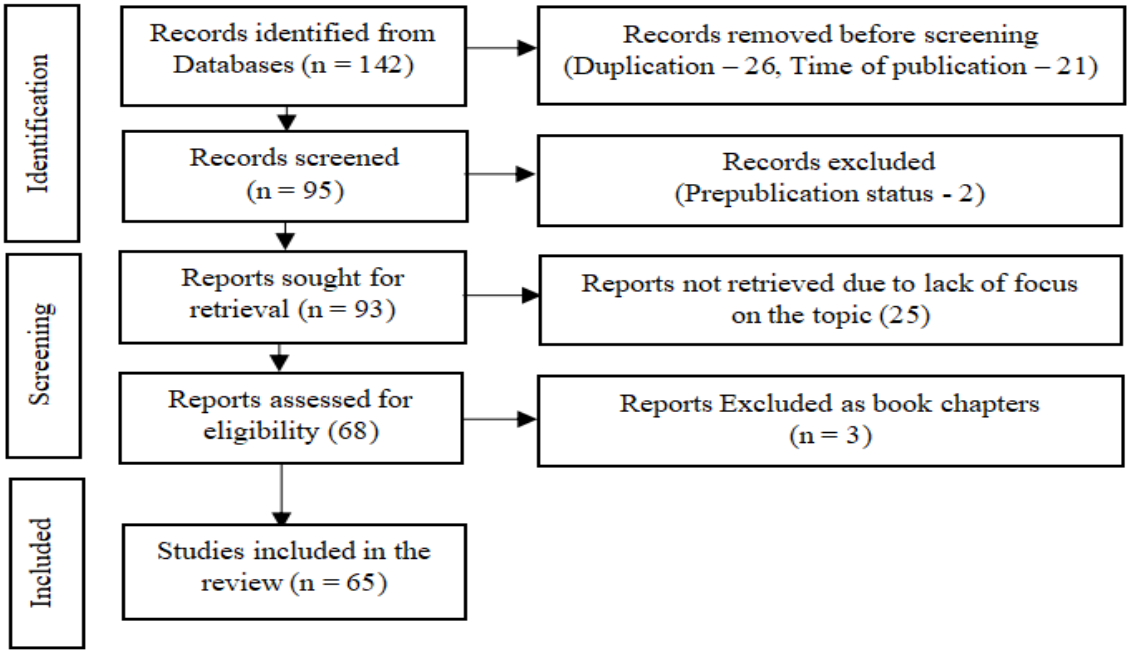
As such, this study focuses on reviewing the significant contributions made by the researchers, towards developing a clear understanding on the transformation of entrepreneurial intention to action. The objectives of this study include developing a clear understanding on the current state of research in the field, classifying the different themes on which these studies were focused on and identifying the aspects that have received limited attention from the past researchers, in the field of intention – action transformation. This study is unique in its nature and contributes to the ongoing discussion towards transformation of entrepreneurial intention to action, through focused systemisation and categorization. Apart from adding value to the available literature, the systemisation and categorization will support the future researchers to avoid reinventing the wheel again.

This review document is structured as follows. The section 2 of this study discusses the review methodology, while section 3 focuses on the results of detailed bibliographic content analysis for the periods 1981 - 2000 and 2001 - 2020. Section 4 focuses on related discussion, conclusions, and identification of avenues for future studies.

2. METHODS

This study has extensively used the research articles published between January 1981 and December 2020, in ABDC ranked journals and other reputed indexed publications. The publications are divided into two categories. First category contains the articles published between year 1981 to 2000, while the second category focuses on the articles published between year 2001 to 2020.

Figure 1. The PRISMA framework



Source: Page et al. (2021)

This study has used PRISMA framework (Liberati et al., 2009; Urrútia & Bonfill, 2010) to identify relevant research articles, as it helps to reduce the risk of bias during selection phase (Lourenço & Jones, 2006; Pittaway & Cope, 2007). Three major databases, namely Scopus, EBSCOhost, and Google Scholar, were used to gather articles relevant to the topic under consideration (Siddique & Bardai, 2023). As majority of the publications indexed in Web of Science are also indexed in Scopus (Singh et al., 2021) and as Scopus and Google scholar helps to identify greater number of articles published in indexed magazines but not covered in web of science (Li et al., 2010; Singh et al., 2021), the author has used both these databases to access relevant articles. EBSCOhost is also used to access relevant articles, as it allows the author to search across multiple databases effectively.

The inclusion clauses considered publications within the topic under consideration, original articles, and review publications in English language, while the exclusion clauses considered duplication, book chapters, publications that do not fall within the designated time frame, publications in other languages and articles with pre-publication status. The initial search considered key words, such as 'intention-action transformation', 'intention to action', 'enterprise creation' and 'transforming entrepreneurial intention to entrepreneurial action', to identify relevant articles. The search examined the existence of these words and phrases, in the title, abstract and key words of the articles considered in this study. This resulted in the selection of 142 articles.

Out of 142 articles, 26 were eliminated for duplication, and another 21 articles were eliminated due to the time of publication. This resulted in 95 articles remaining for further scrutiny. The abstracts of all 95 articles were read to ensure their suitability for this study. 2 of the articles were excluded due to pre-publication status along with another 25 articles that were not directly related to the topic and another 3 for being book chapters. This resulted in 65 articles being considered for the final analysis. Out of the 65 articles, 17 articles were published between the years 1981 and 2000, while another 48 articles were published between the years 2001 and 2020. These articles were considered for detailed analysis.

This study has used 'Zotero' open-source research tool for the purpose of collecting, organiz-

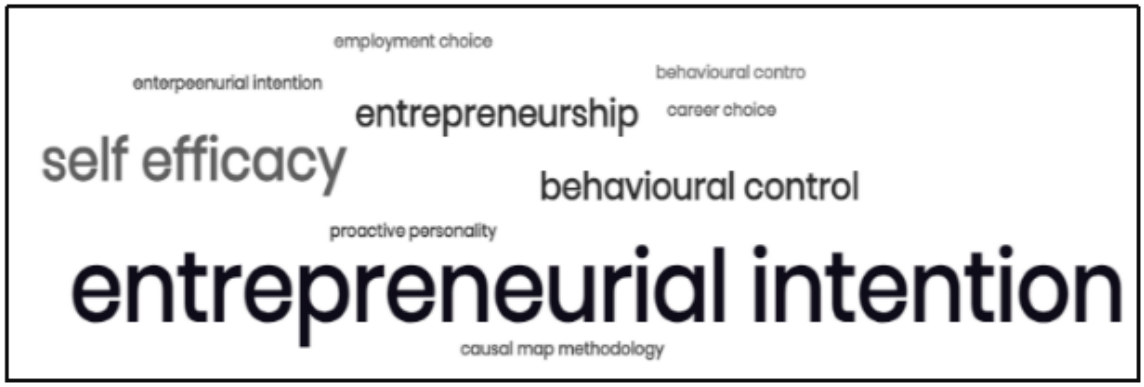
ing, and analyzing the information. This study has also used VOS viewer software to develop overlay visualization using keywords.

3. RESULTS

3. 1. IN-DEPTH ANALYSIS OF ARTICLES PUBLISHED BETWEEN 1981 AND 2000

Articles published during the 1981 – 2000 period have mainly focused on understanding the factors that influence entrepreneurial intention. This is because of the belief that entrepreneurial intention is the antecedent of action, and any such action directly correlates with the intention.

Figure 2. The Word cloud for Key Words



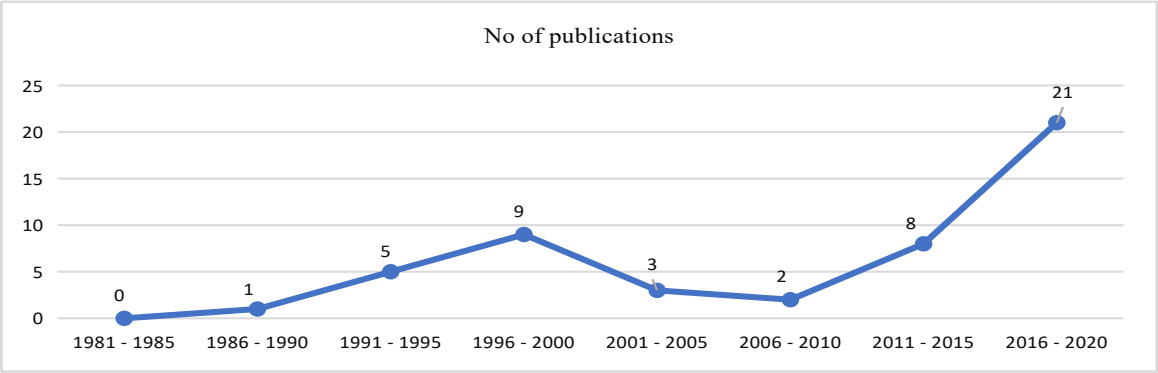
Source: Author's compilation

This premise has exerted major influence on the studies conducted during this period and has led to majority of the researchers focusing on entrepreneurial intentions, rather than entrepreneurial action or the intention action transformation. Very few studies conducted during this period have transcended from the general focus and has touched on the areas of entrepreneurial action and transformation. The word cloud created by the author using the key words used in the articles also support this point, by identifying entrepreneurial intention as the key word with the highest occurrence. This review found the transformation aspect to be not the major research focus during the period under consideration.

Majority of the articles published (45%) during this period (1981 – 2000) have focused on personal factors and its influence on improving the entrepreneurial intentions. Apart from personal factors, studies published during the period under consideration, have also focused on the influence of entrepreneurial exposure (25%), followed by family background (15%), social factors (5%) and environmental (5%) factors as well.

The growth of publication during this period has been very low with only one publication concentrating on this aspect during the first decade followed up by 16 related publications during the second decade (1991 – 2000). Majority of the studies published during this period have originated from the research field of Business and Management, with only few of them focusing on social sciences Though there was an increase in the number of publications, the research articles published during this period have mainly considered the factors that influence entrepreneurial intention and have largely followed on the observations of Shapero and Sokal (1982) and Bird (1988) as the basis for their discussion. Given this focus, these studies have mainly focused on the role played by both personal and social factors in improving the formation of entrepreneurial intention within the targeted populations.

Figure 3. No of publications during 1981 - 2020



Source: Author's compilation

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The research interest during this period has mainly come from the European and American regions with nearly all the published studies coming from the region with the exemption of just 1 study. This explains that the concept was gaining momentum mainly in European and American regions during this period, with very little focus coming from other regions. The fact that majority of these articles were published in A* and A ranked journals (ABDC ranking) showed the highly focused nature of these studies. However, the major focus on European and American regions showed the research interest in entrepreneurship has not reached some of the highly populated region such as Asia, thereby making the concept more 'foreign' to other regions.

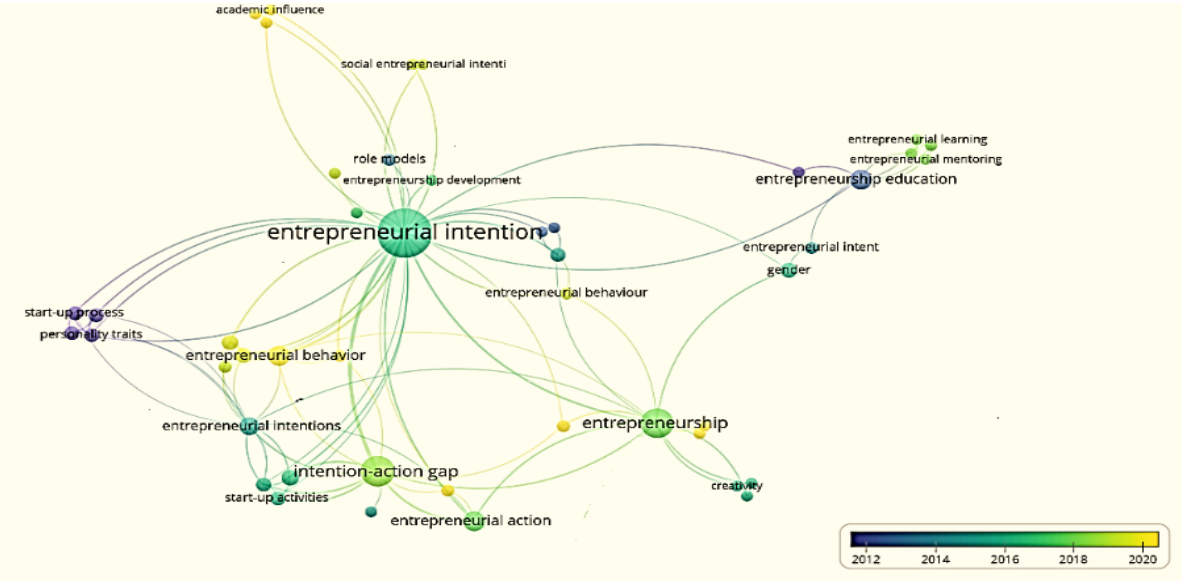
Majority of the articles published during this period (41.2%) have considered University students as their unit of observation with another 23.5% using entrepreneurs as their unit of observation. Though the researchers have justified this choice due to issues such as accessibility, convenience, controlled environment and generalizability, the practice of using University students as the unit of observation, could bring in bias due to limited life experience of the participants. Similarly, majority of the studies (11 out of 17 studies) have focused on quantitative research design with regression analysis being the most popular technique used for analysis. This shows the limited interest among researchers to transcend from the norms to work with higher order quantitative techniques such as structural equation modelling and multilevel modelling.

3. 2. IN-DEPTH ANALYSIS OF ARTICLES PUBLISHED BETWEEN 2001 AND 2021

In-depth analysis of the articles published during the period 2001 and 2020 showed similarity in the trend with the previous period, during the first decade. Considerable amount of research publications during this period has also focused on entrepreneurial intention and the factors that influence entrepreneurial intention. However, the interest on identifying the factors that influence the transformation of such intention into action has seen a gradual growth during the second decade, with publications between year 2016 - 2020 period reaching the highest point and representing 46% of the total number of articles published over the past two decades. Majority of the articles published

during this period have questioned the assumption of direct correlation between entrepreneurial intention and action and have focused more on the factors influencing the transformation of entrepreneurial intention to action, thereby displaying a paradigm shift in focus among the research fraternity.

Figure 4. Overlay Visualisation

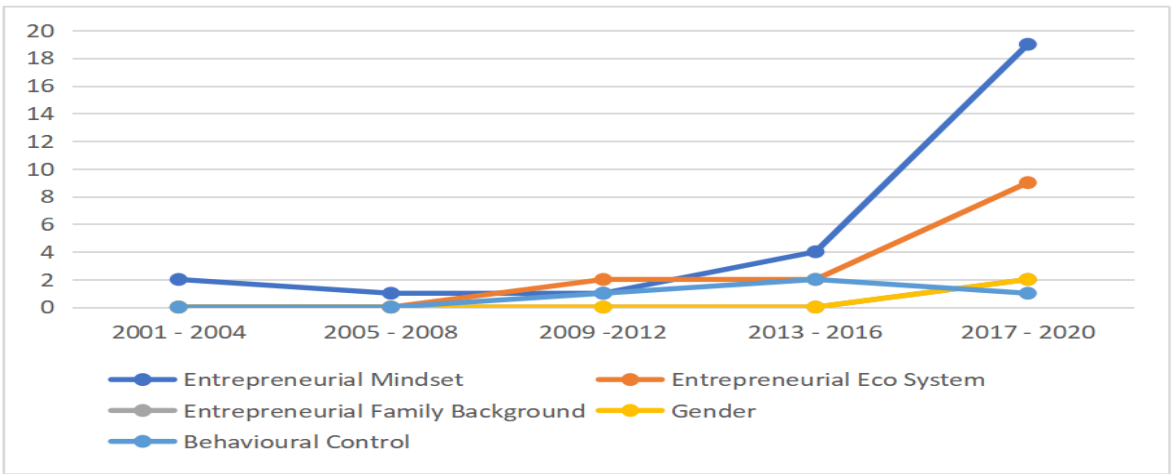


Source: Author's Compilation

This paradigm shift was highlighted by the overlay visualisation diagram, developed with the keywords used by the researchers. The diagram displayed the entrepreneurial intention (biggest node) as a dominant keyword among researchers. Similarly, the relatively smaller size of the node for intention action gap, and the lighter shade of colours displayed in the overlay visualization diagram for year 2016 - 2020 period, showed that more and more researchers have considered intention action relationship as an important aspect, and have used intention-action gap as a key word in their studies. This observation further supported the presumption about the paradigm shift in focus from entrepreneurial intention to intention action relationship.

Majority of the studies conducted during the year 2001 – 2020 period were found to be centred upon five overarching themes.

Figure 5. Research Themes



Source: Author's compilation

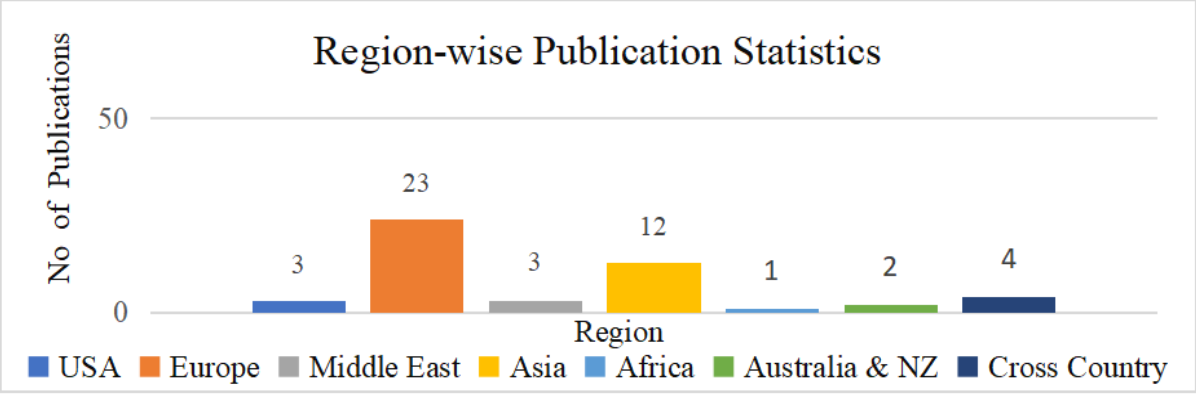
The first theme, Entrepreneurial mindset, consisted of articles focusing on effectuation, opportunity recognition, belief, perception towards success, skills, competencies, knowledge structure, attitude, personality, entrepreneurial orientation, economic context, and entrepreneurial deviance. In other words, articles falling within this theme has focused on the entrepreneur's ability to manage the unpredictable start-up phase. The second theme, Entrepreneur's family background, focused on the articles that considered the role played by the prospective entrepreneur's family background on their entrepreneurial journey. The third theme, Gender, considered articles discussing about the influence of Gender. The fourth theme, Behavioural control, considered articles focused on procrastination, perception towards barriers, risk taking, perception towards new product success and uncertainty avoidance. The last theme, Entrepreneurial Ecosystem, consisted of articles focused on the role of entrepreneurial education, government support, national culture, availability of role models, entrepreneurial environment, and process control factors. Designation of these themes helped the author to identify the trend followed by researchers studying the intention-action transformation, over the past two decades.

This study has noticed a major growth of publications in the field under consideration during the last decade (year 2011 – 2020). The study has also identified an enhanced research focus towards entrepreneurial mindset, with 27 articles focusing on at least one aspect of this theme. Focus on this theme has gradually gained prominence among the research fraternity with the peak being in the period between year 2017 – 2020. Focus on the impact of entrepreneurial ecosystem (Theme 5) has also improved gradually over the last two decades with the peak being in year 2017 – 2020 period. This study was able to identify 13 articles focusing on at least one aspect of the theme Entrepreneurial ecosystem. Other themes, gender (Theme 3), behavioural control (Theme 4) and entrepreneur's family background (Theme 2) have received limited attention from the research fraternity, over the past two decades, with only 4 articles focusing on behavioural control and only 2 articles focusing on both Gender and Entrepreneur's family background.

Although the research area was expected to be multi-disciplinary in nature, majority of articles published (n = 39) during the period (2001 – 2020) have originated from the research field of Business and Management. This is followed by publications originating from other research fields such as Psychology and Social Sciences (n = 5), Education and Training (n = 2), Information Technology (n = 1) and Economics (n =1) as well. The articles published were also found to command higher recognition among the research community.

Similar to the first period under consideration (year 1981 – 2000), European region was found to generate the highest amount of research interest on the topic under consideration.

Figure 6. Region-wise publication statistics 2001 – 2020



Source: Author's Compilation

48% of the research articles published have focused on the European region with another 25% focusing on the Asian region. Spain tops the publications in the European region with 5 articles, followed by Austria, Estonia, France, Germany, Netherlands, Portugal, and United Kingdom with two publications each. The Asian region was dominated by India, China, and Indonesia with 3 articles being focused on each country. Only three research articles were published in USA, 2 in Australia & New Zealand and one article published in the African region. The middle east region has accounted for only 6% of the publications (3 articles) with Iran accounting for 2 of those publications. This shows a clear difference in the level of research interest among different regions.

Table 1. Nature of the research and unit of observation

Nature of Research	Total	%of the Sample	Unit of Observation	Total	% of the Sample
Mixed	2	4.2	Students	1	2.08
			Nascent Entrepreneurs	1	2.08
Qualitative	9	18.8	Students	4	8.33
			Nascent Entrepreneurs	1	2.08
			Established Business Owners	4	8.33
Quantitative	37	77	Students	27	56.25
			Nascent Entrepreneurs	5	10.42
			Established Business Owners	5	10.42

Source: Author's Compilation

In-depth analysis on the nature of the research during the period under consideration (year 2001 – 2020) found 78% of the research publications (39 publications) to be quantitative in nature. This is followed by 18% of the studies choosing qualitative methodology and 4% of the studies following mixed methodology. 68% of the samples chosen for all the studies were students studying in different tertiary educational institutions. This percentage was higher among researchers who using quantitative methodology, compared to researchers using qualitative methodology. 74.4% of the researchers following quantitative methodology, have used university students as their samples, while 44.4% of the researchers using qualitative methodology has considered students as their samples. 44.4% of the qualitative researchers have used established business owners as their samples, compared to 12.8% researchers following quantitative methodology. However, only 12.8% of the researchers using quantitative methodology and 11.1% of the researchers using qualitative methodology have considered Nascent entrepreneurs as their samples. This shows that researchers following both qualitative and quantitative methodologies have preferred using university students for data collection. The analysis also found Nascent entrepreneurs to be the least preferred group as samples, by researchers following both qualitative and quantitative methodologies.

The studies published between the year 2001 and 2020 also found regression analysis to be the most preferred method for data analysis within this research area. Out of the articles considered for this study, 18 have used regression analysis while 17 studies have used Structural Equation Modelling to analyse the information. 9 studies have used qualitative techniques to analyse the information. Though various methods were used by researchers for analysis during this period, regression analysis and structural equation modelling were found to be the most preferred method of data analysis for studies focused on quantitative research methodology.

4. DISCUSSION

Transformation of entrepreneurial intention to action is an emerging field of research that has attracted reasonable interest from the research community during the past decade. Though majority of the studies conducted between the years 1981 – 2000 have focused mainly on entrepreneurial intention, the research interest on transformation of entrepreneurial intention to action has grown significantly over the past decade, with the research interest reaching almost threefold year on year growth during the 2017 – 2020 period. Past studies have mainly considered entrepreneurial intention to have a direct correlation with entrepreneurial action. This premise was instrumental in encouraging more and more researchers to focus on entrepreneurial action, rather than focusing on any other aspects. It is interesting to note that most of the studies conducted in the field of study, during the periods (both) under consideration, were published in ABDC ranked (A* - C) journals in business and management areas. This further validates the academic rigor and scientific validity of these studies, thereby adding value to the available literature.

The study has found that majority of articles published within the research area during 1981 – 2000 period, could be broadly categorised under the theme 'psychosocial influence'. This shows the restricted focus among the research fraternity during the period under consideration. However, the research publications during 2001 – 2020 period have expanded their scope and focused on five major themes, namely entrepreneurial mindset, entrepreneur's family background, gender, behavioural control and entrepreneurial eco system. It is also important to note that all these themes are equally important for a successful entrepreneurship journey.

The fact that majority of the studies conducted have been categorised under the theme entrepreneurial mindset shows the dominant focus of researchers on person specific skills and competencies related variables. This review also disclosed the limited focus on other themes by the past researchers, thereby highlighting the need for further studies in the field. As many of the countries are prioritising investments on education and infrastructure development to facilitate the transformation of entrepreneurial intention to action, studies focusing on the importance and influence of other themes such as gender, entrepreneur's family background, behavioural control and entrepreneurial eco system, would add greater value to both literary and practice fronts. This also shows the need for more comprehensive studies focusing on the direct, mediating, and moderating influence of such factors in this research field. Such studies could provide a better understanding of factors influencing the transformation of entrepreneurial intention into entrepreneurial action and the type of influence exerted by those factors.

This review has found majority of the articles published within the field of study during year 1981 – 2000 period to originate from the European and American regions. However, this trend was found to have changed to a greater extend during year 2001 – 2020 period, where 48% of studies originated from European and Asian regions, with minimum contribution coming from other regions such as USA, Middle east, Africa, Australia, and New Zealand. While indicating a shift in research interest, this also indicates the need for more studies from other regions. The findings also emphasize the importance of conducting studies on more diversified fields to improve the understanding towards the factors affecting the transformation of entrepreneurial intention into action.

This review has also identified the growing interest in using regression analysis and structural equation modelling techniques to analyse data, in quantitative research between 2017 and 2020. This shows the growing trend among researchers towards using such techniques for data analysis. This finding on the methodological approach followed by majority of researchers would

help the future researchers to understand the past trend and make appropriate decisions towards data analysis.

This review has identified a consistent trend over the entire period under consideration, where the researchers have used university students as their primary unit of analysis. Only a handful of researchers have deviated from this trend and chosen others such as nascent entrepreneurs or established businesses as their unit of observations. However, the success of using university students as the unit of analysis will depend on the level of entrepreneurship related knowledge and exposure the students receive, as part of their academic programs. This requires the universities to create opportunities for both theory and practice-based knowledge accumulation, so that the students will possess the required knowledge to make informed decisions. This further reinforces the role of universities in imparting the entrepreneurship related knowledge and preparing their students for the challenges in the future. Such a focused preparation could influence the perception of the students, and thereby improve the quality of results of the research studies conducted using them as the subjects.

The co-occurrence analysis supported by overlay visualization also supported the past observations related to major research focus towards entrepreneurial intention and the relative infancy of research focus towards the transformation of entrepreneurial intention to entrepreneurial action. This relative infancy further highlights the importance of more research in this field of study, under different contexts, as detailed understanding of the factors that influence intention-action transformation will play a major role in encouraging such transformation among the prospective entrepreneurs.

5. CONCLUSION

This study has made a concentrated effort to develop a detailed understanding towards the state of research related to the transformation of entrepreneurial intention to action, over the past 40 years. The research area was found to be still in its infancy, with more and more researchers showing interest in recent years. The study also found quantitative methodology to be the most preferred among researchers with regression analysis and structural equation modelling being mainly used for data analysis. This review noticed the dominant usage of university students as unit of observation. This could be a useful practice as their views and perceptions as prospective future entrepreneurs, could add more value and relevance to the research findings. This systematic literature review has also identified the dominant themes followed during the two periods under consideration, and the limited focus on themes such as gender, family background, behavioural control and entrepreneurial eco system. This emphasises the importance of conducting detailed studies on other themes in future. Similarly, this study has also highlighted the importance of research publications coming from different regions, as such publications could add more value with diverse range of perspectives to the available literature. Overall, this systematic literature review has provided a clear idea on the current state of research related to entrepreneurial intention and action while demonstrating how the research field has evolved over the past 40 years.

This study presents useful implications to multiple stakeholders. The findings of this study could be an inspiration for future researchers as it helps them to identify the focus of past researchers and refine their approach towards future studies. This study could also support the administrators and policy makers, in developing, refining, and improving public policies towards facilitating such transformation. Universities and other educational institutions involved in supporting the aspiring entrepreneurs, could also use the knowledge generated by this study

to reflect on their own practices and re-define their perspectives and strategies.

This systematic literature review also has the following limitation. Despite all the efforts of the author to collect related studies from reputed databases, the literature search may have still failed to collect all the studies published in this field of research. This may have resulted in certain level of bias in the analysis. Secondly, this study has excluded certain articles without analysing the content and findings, due to their pre-publication status. These articles could also have contained information useful for this study. Hence the readers need to be aware of these limitations while interpreting the findings.

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Appendix. Articles used for this Systematic Literature Review						
Author	Country	Title	Sample Size	Unit of Observation	Design / Approach	Subject Area
Adhikary, B. K., Kutsuna, K., & Stephannie, S.	Indonesia	Does the government credit guarantee promote micro, small, and medium enterprises? Evidence from Indonesia	Panel Data	Enterprises requiring GCC	Quantitative	Business & Management
Ahuja, V., Akhtar, A. & Wali, O. P.	India	Development of a comprehensive model of social entrepreneurial intention formation using a quality tool	43	University Students	Qualitative	Business & Management
Alam, M. Z., Kousar, S., & Rehman, C. A.	Pakistan	Role of entrepreneurial motivation on entrepreneurial intentions and behaviour: theory of planned behaviour extension on engineering students in Pakistan	448	University Students	Quantitative	Business & Management
Al-Mamun, A., Nawi, N. B. C., Mohiuddin, M., Shamsudin, S, F. F. B., & Fazal, S. A.	Malaysia	Entrepreneurial intention and startup preparation: A study among business students in Malaysia	375	University Students	Quantitative	Education & Training
Antonacopoulou, E. P., & Fuller, T.	United Kingdom	Practising entrepreneuring as emplacement: the impact of sensation and anticipation in entrepreneurial action		Nascent Entrepreneurs	Qualitative	Business & Management
Bagozzi, R. P.	USA	On the Concept of Intentional Social Action in Consumer Behaviour	Secondary sources	Available secondary articles	Qualitative Design	Business & Management
Barba-Sánchez, V., & Atienza-Sahuquillo, C.	Spain	Entrepreneurial intention among engineering students: The role of entrepreneurship education	414	University Students	Quantitative	Business & Management
Baron, R. A.	USA	Psychological Perspectives on Entrepreneurship: Cognitive and Social Factors in Entrepreneurs' Success	250	Entrepreneurs	Quantitative Design (Survey)	Business & Management
Bernardus, D., Murwani, F. D., Ardyan, E., Padmawidjaja, L., Aji, I. D. K., Jatiperwira, S Y., Kusumojanto, D. D., Wardoyo, C., & Hermanto, Y. B.	Indonesia	Which psychological characteristics strengthen "The entrepreneurial intention-action relationship"- An extension of the theory of planned behaviour	188	University Students	Quantitative	Business & Management
Bird, B.	USA	Implementing Entrepreneurial Ideas: The Case for Intention	20	Entrepreneurs	Qualitative Design (Interview)	Entrepreneurship Theory
Birrell, S.	Australia	the Role of Mentoring and Peer Support in Contributing to Perceived Progress Towards Small Business Success: A Cross Sectional Study	75	Nascent Entrepreneurs	Mixed	Business & Management

Appendix. Articles used for this Systematic Literature Review						
Author	Country	Title	Sample Size	Unit of Observation	Design / Approach	Subject Area
Bogatyreva, K., Edelman, L. F., Manolova, T. S., Osiyevskyy, O., & Shirokova, G.	Cross Country	When do entrepreneurial intentions lead to actions? The role of national culture	1434	University Students	Quantitative	Business & Management
Bogatyreva, K. & Shirokova, G.	Russia	From entrepreneurial aspirations to founding a business: The case of Russian students	4484	University Students	Quantitative	Business & Management
Bosma, N., Hessels, J., Schutjens, V., Praag, M. V., & Verheul, I.	Netherlands	Entrepreneurship and role models	292	Entrepreneurial Intention	Quantitative	Psychology and Social Sciences
Boyd, N. G., & Vozikins, G. S.	USA	The Influence of Self-Efficacy on the Development of Entrepreneurial Intentions and Actions	Secondary sources	Available secondary articles	Qualitative Design (Interview)	Business & Management
Delanoë-Gueguen, S., & Liñán, F.	France	A longitudinal analysis of the influence of career motivations on entrepreneurial intention and action	115	University Students	Quantitative	Business & Management
Duarte A. A., Kiat K. S., O'Brien, S., & Geneste, L.	New Zealand	Understanding entrepreneurial deviance through social learning and entrepreneurial action theory: an empirical study	52	Honey Producers	Qualitative	Business & Management
Emami, A., & Klein, P. G.	Iran	The entrepreneurial propensity for market analysis and the intention-action gap	213	Prospective Entrepreneurs	Quantitative	Business & Management
Engle, R. L., Schlaegel, C., Delanoe, & Servane	USA	The Role of Social Influence, Culture, and Gender on Entrepreneurial Intent	2164	University Students	Quantitative	Business & Management
Esfandiar, K., Sharifi-Tehrani, M., Pratt, S, & Altinay, L.	Iran	Understanding entrepreneurial intentions: A developed integrated structural model approach	390	University Students	Quantitative	Business & Management
Esfandiar, K., Sharifi-Tehrani, M., Pratt, S, & Altinay, L.	Iran	Understanding entrepreneurial intentions: A developed integrated structural model approach	390	University Students	Quantitative	Business & Management
Erikson, T.	UK	A study of entrepreneurial career choices among MBAs - the extended bird model	65	University Students	Quantitative Design (Survey)	Business & Management
Frank, H., Lueger, M., & Korunka, C.	Austria	The significance of personality in business start-up intentions, start-up realization and business success	5983	Higher Secondary Students	Quantitative	Business & Management
Furlotti, M., Podoynitsyna, K., & Mauer, R.	Netherlands	Means versus goals at the starting line: Performance and conditions of effectiveness of entrepreneurial action	255	Nascent Entrepreneurs	Quantitative	Business & Management

Appendix. Articles used for this Systematic Literature Review						
Author	Country	Title	Sample Size	Unit of Observation	Design / Approach	Subject Area
González-López, M. J., Pérez-López, M. C., & Rodríguez-Ariza, L.	Spain	From potential to early nascent entrepreneurship: the role of entrepreneurial competencies	227	University Students	Quantitative	Business & Management
Harima, A., Gießelmann, J., Göttsch, V., & Schlichting, L.	Germany	Entrepreneurship? Let us do it later: procrastination in the intention–behaviour gap of student entrepreneurship	1	University Students	Qualitative	Business & Management
Gabay-Mariani, L., & Boissin, J.	France	Commitment profiles of nascent entrepreneurs: insights from an empirical taxonomy among French student entrepreneurs	328	Student Entrepreneurs	Quantitative	Business & Management
Guo, Z., & Jiang, W.	China	Risk-taking for entrepreneurial new entry: risk-taking dimensions and contingencies	186	Manufacturing firms	Quantitative	Business & Management
Gustomo, A., Ghina, A., Anggadwita, G., & Herliana, S.	Indonesia	Exploring entrepreneurial competencies in identifying ideas and opportunities, managing resources, and taking action: Evidence from small catering business owners in Bandung, Indonesia	1	Catering Business Owners	Qualitative	Business & Management
Jenkins, M. J., & Grey, J.	UK	Entrepreneurial Intentions and Outcomes: A Comparative Causal Mapping Study	30	Small Businessmen	Qualitative Design (Interview)	Entrepreneurship
Jin, C. H.	South Korea, China	The effect of psychological capital on start-up intention among young start-up entrepreneurs: A cross-cultural comparison	600	Nascent Entrepreneurs	Quantitative	Business & Management
Kallas, E., & Parts, E.	Estonia	From entrepreneurial intention to enterprise creation: the case of Estonia	1492	Prospective Entrepreneurs	Quantitative	Business & Management
Kickul, J., & Zaper, J. A.	Europe	Untying the Knot: Do Personal and Organizational Determinants Influence Entrepreneurial Intentions?	322	University Students	Quantitative Design (Survey)	Business & Management
Kolvereid, L.	Norway	Prediction of Employment Status Choice Intentions	128	University Students	Quantitative Design (Survey)	Business & Management
Kong, F., Zhao, L., & Tsai, C.	China	The Relationship Between Entrepreneurial Intention and Action: The Effects of Fear of Failure and Role Model	1865	University Students	Quantitative	Psychology and Social Sciences
Krueger, N.	Ireland	The Impact of Prior Entrepreneurial Exposure on Perceptions of New Venture Feasibility and Desirability	126	University Students	Quantitative Design (Survey)	Business & Management
Kreuger, N. F., & Carsrud, A. N.	Ireland	Entrepreneurship intentions; organizational emergence; planned behaviour; process models; pre-organizations.	Secondary sources	Available secondary articles	Qualitative Design (Interview)	Business & Management

Appendix. Articles used for this Systematic Literature Review						
Author	Country	Title	Sample Size	Unit of Observation	Design / Approach	Subject Area
Krueger, N. F., Reilly, M. D., & Carsrud, A. L.	USA	Competing models of entrepreneurial intentions	97	Prospective Entrepreneurs	Quantitative	Business & Management
Kubberød, E., Fosstenløkken, S. M, & Erstad, P. O.	Norway	Peer mentoring in entrepreneurship education: towards a role typology	1	University Students	Qualitative	Education & Training
Lecuna, A.	Cross country	Income inequality and entrepreneurship	Panel Data	Established Entrepreneurs	Quantitative	Economics
Li, C., Murad, M., Shahzad, F., Khan, M. A. S., Ashraf, S. F., & Dogbe, C. S. K	China	Entrepreneurial Passion to Entrepreneurial Behaviour: Role of Entrepreneurial Alertness, Entrepreneurial Self-Efficacy and Proactive Personality	346	University Students	Quantitative	Psychology and Social Sciences
Linan, F.	Spain	Intention-based models of entrepreneurship education	166	University Students	Quantitative	Business & Management
Liñán, F., & Chen, Y,	Spain	Development and Cross–Cultural Application of a Specific Instrument to Measure Entrepreneurial Intentions	519	University Students	Quantitative	Business & Management
Lingappa, A. K., Shah, A., & Mathew, A. O.	India	Academic, Family, and Peer Influence on Entrepreneurial Intention of Engineering Students	210	University Students	Quantitative	Business & Management
Michael, C. J.	Indiana, USA	The proactive personality scale as a predictor of entrepreneurial intentions	181	University Students	Quantitative Design (Survey)	Business & Management
Moghavvemi, S., Salleh, N., Sulaiman, A., & Abessi, M.	Malaysia	Effect of external factors on intention–behaviour gap	351	Nascent Entrepreneurs	Quantitative	Information Technology
Muzyka, D., De Koning, A., & Churchill, N.		On transformation and adaptation: Building the entrepreneurial corporation	Secondary sources	Available secondary articles	Qualitative Design	Business & Management
Nabi, G., & Liñán, F.	Spain	Considering business start-up in recession time: The role of risk perception and economic context in shaping the entrepreneurial intent	619	University Students	Quantitative	Business & Management
Neneh, B. N.	South Africa	From entrepreneurial alertness to entrepreneurial behaviour: The role of trait competitiveness and proactive personality	533	University Students	Quantitative	Psychology and Social Sciences
Nikou, S., Brännback, M., Carsrud, A. L., & Brush, C. G.	Cross Country	Entrepreneurial intentions and gender: pathways to start-up	2038	University Students	Qualitative	Business & Management

Appendix. Articles used for this Systematic Literature Review

Author	Country	Title	Sample Size	Unit of Observation	Design / Approach	Subject Area
Oliveira, A., & Rua, O. L.	Portugal	From intention to entrepreneurial action: Assessing the impact of the barriers on the creation of new organizations	569	Prospective Entrepreneurs	Quantitative	Business & Management
Orbell, S., Hodgkins, S., & Sheeran, P	UK	Implementation Intentions and the Theory of Planned Behaviour	155	Female University Staff	Quantitative Design (Survey)	Business & Management
Ozaralli, N., & Rivenburgh, N. K.	USA	Entrepreneurial intention: antecedents to entrepreneurial behaviour in the U.S.A. and Turkey	589	University Students	Quantitative	Business & Management
Rai, R., Prasad, A., & Murthy, B. K.	India	A review on intention models for predicting entrepreneurial behaviour		Prospective Entrepreneurs	Qualitative	Education & Training
Schepers, J., Voordeckers, W. T., & Laveren, E.	Belgium	Entrepreneurial intention-action gap in family firms: bifurcation bias and the board of directors as an economizing mechanism		Entrepreneurial Families	Quantitative	Business & Management
Shaver, K. G., & Scott, L. R.		Person, Process, Choice: The Psychology of New Venture Creation	Secondary sources	Available secondary articles	Qualitative Design	Business & Management
Shirokova, G., Osiyevskyy, O., & Bogatyreva, K.	Cross Country	Exploring the intention–behaviour link in student entrepreneurship: Moderating effects of individual and environmental characteristics	70164	University Students	Quantitative	Business & Management
Tkachew, E., & Kolveried, L.	Russia	Self-employment intentions among Russian students	512	University Students	Quantitative Design	Business & Management
Van Gelderen, M., Kautonen, T., & Fink, M.	Finland	From entrepreneurial intentions to actions: Self-control and action-related doubt, fear, and aversion	763	Prospective Entrepreneurs	Quantitative	Business & Management
Venesaar, U., Kallaste, M., & Küttim, M.	Estonia	Factors Influencing Students' Venture Creation Process	52899	Students	Quantitative	Psychology and Social Sciences
Watson, T. J.	United Kingdom	Entrepreneurship in action: Bringing together the individual, organizational and institutional dimensions of entrepreneurial action		Educators, Entrepreneurs	Qualitative	Business & Management
Weiss, J., Anisimova, T., & Shirokova, G.	Sweden	The translation of entrepreneurial intention into start-up behaviour: The moderating role of regional social capital	663	Nascent Entrepreneurs	Quantitative	Business & Management
Zapkau, F. B., Schwens, C., Steinmetz, H., & Kabst, R.	Germany	Disentangling the effect of prior entrepreneurial exposure on entrepreneurial intention	374	Nascent Entrepreneurs	Quantitative	Business & Management
Zehrer, A., & Leiß, G.	Austria	Family entrepreneurial resilience – an intergenerational learning approach	1	Entrepreneurial Families	Qualitative	Business & Management

Source: Author's Compilation

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ANALYZING THE RELATIONSHIP BETWEEN INVENTORY POLICIES AND CSR PRACTICES: CASE OF JORDANIAN COMPANIES

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ABSTRACT

The present research aims to assess the impact of inventory policies on the Corporate Social Responsibility practices of companies listed on the Amman Stock Exchange. The companies included in the research belonged to manufacturing or related sectors in which holding inventory is inevitable. The sample size chosen for the research was 45 companies, mainly because of the availability of financial data from the period 2012 to 2022. The data for the research was extracted from the Amman Stock Exchange, and we utilized a regression-based ANOVA model for our analysis, containing the dummy variable to enhance the model's validation and facilitate the statistical analysis, hence enabling a deeper understanding. We utilized. We also used the GMM model to validate our analysis. The financial variables of the research were based on the reported financial statements of the companies. The study explores the impact of the relationship between inventory policy and Corporate Social Responsibility on the different stakeholders, such as customers, employees, and environmental groups. We found that the CSR disclosure requirements also tend to have an impact on the inventory policies of these companies. Our results revealed that inventory levels are positively associated with satisfied customers. We found that the company's total CSR and sales ratio do not have a straight-line relationship. It led us to conclude that inventory levels are positively associated with satisfied customers.

Keywords: *Inventory, CSR, Inventory to sales ratio, Amman Stock Exchange, GMM, Manufacturing sector*

1. INTRODUCTION

The phrase "inventory" refers to a company's vital supplies. The investments mentioned above make up a large part of the company's investment portfolio and must be managed carefully to maximize results. Many organizations cannot afford the financial consequences of poor inventory management. Inventory management is essential to reduce costs, unreliability, and inefficiency. Products with economic value that an organization holds in various states, such as awaiting packaging, processing, conversion, use, or sale, are called inventory. According to (Laan, Salomon, Dekker, & Wassenhove, 1999), inventory management is the strategic framework firms use to manage their inventory. The task comprises monitoring inventory levels, predicting demand, and choosing the best time and method for making preparations. Firms use inventory management to store, organize, and refill inventory to ensure an appropriate supply

of commodities and reduce costs (Toktay, Wein, & Zenios, 2000).

Active corporate social responsibility (CSR) can increase stakeholder support behaviors, such as buying their products or services, applying for jobs, and investing in the company. Such actions can also improve stakeholders' views of these companies. These efforts strengthen a company's brand, stakeholder-company ties, and stakeholder advocacy over time. Due to stakeholders' inadequate awareness and negative opinions of corporate social responsibility (CSR) activities, corporations can't fully capitalize on their economic benefits. It emphasizes the need for corporations to improve their communication methods to communicate CSR efforts to stakeholders better. This paper proposes a business communication framework for corporate social responsibility (CSR), given the challenges. The framework includes message structure, dissemination strategies, and CSR communication success factors for stakeholders and enterprises. Different hypotheses link corporate social performance (CSP) and inventory management. Large and small businesses depend on inventory movement control along the value chain. The delicate balance between inventory supply and demand is a major difficulty in inventory management. A company should keep enough inventory to meet customer demand and avoid stock-outs that cost money. Due to the financial ramifications of inventory management, the company does not keep too much stock. Inventory decisions greatly affect supply chain management. Inventory management systems are becoming increasingly important (Koumanakos, 2008a; Silver, 2008).

Guping et al. (2021) classified these links with a typology. The social effect (tradeoff) theory suggests that improved corporate social performance (CSP) will negatively impact inventory management. Accessible funding, or management opportunism, claims that financial success affects corporate social performance (CSP). Positive and negative synergy theories link inventory management and corporate social performance (CSP). Much academic research on corporate ethics and finance has studied the financial benefits of Corporate Social Performance. The main concern is that CSR programs may hurt shareholders financially (A.B. Carroll, Lipartito, Post, Werhane, & Goodpaster, 2012). Stockholder welfare may include more than financial gains, although investors prioritize financial return.

However, adopting a socially responsible approach can benefit investors and other stakeholders. External factors like corporate social responsibility (CSR) might affect the relationship between corporate social performance (CSP) and inventory management. The literature contains a variety of facts. (Pinkston & Carroll, 1996), and others have discovered a positive correlation. Variables show a negative association in previous studies (Visser, 2011). Many scholars (Archie B. Carroll, 2016) claim no correlation. Bowman and Haire proposed an inverted "U" connection in 1975 to maximize firm value through corporate social performance (CSP). Inventory is essential for all businesses. Stock management has traditionally focused on quantity and delivery time (Flores, Olson, & Dorai, 1992). Scholarly research in inventory management focuses on minimizing stock-outs and optimizing inventory control techniques to reduce costs. Recent studies and empirical evidence show that inventory management goes beyond real-time adjustments. Inventory is essential to the package. Internal and external stakeholders heavily impact corporate inventory regulation planning. Personal interests, views, and impacts differ (Lolli, Ishizaka, Gamberini, Balugani, & Rimini, 2017). Strategic decisions like inventory management can affect an organization's daily operations (Hadad & Keren, 2013). Multiple studies have revealed that employees may use different system adoption and deployment tactics. Research by (Pérez-Vergara, Cifuentes-Laguna, Vásquez-García, & Marcela-Ocampo, 2013) highlighted that political and social factors may affect inventories and operations. Therefore, inventory management systems often involve several stakeholders. The stakeholder definition used by (Freeman & Phillips, 2002; Haji Ibrahim, Kalash, & Sabsabİ, 2018) is typical.

Stakeholders are any group or individual that can affect a company's goals. This group may include investors, staff, residents, tourists, and nature. Organizational performance depends on stakeholders' impact on corporate decision-making. Recent years have seen a rise in corporate social responsibility (CSR) efforts that place a premium on stakeholder relationships. Jordan's economy grew faster than predicted in the first half of 2022 despite global economic woes. Real GDP rose to 2.7% due to the complete economy reopening, rising exports, and more foreign tourists. The unemployment rate is slowly dropping. Therefore, labor market statistics don't fully reflect economic growth. During 2018, economic growth continued, and tourism revenue rose 41% annually between January and August. Foreign direct investment rose 86% annually in the second quarter. In the first half of 2023, industrial exports rose yearly and made up 96% of national exports. Domestic consumer expenditure is predicted to remain high in the first eight months of 2023 due to lower average inflation than in 2022. The commodities export sector started the third quarter poorly in July as industrial output declined. Japan has provided a USD 100 million loan to help implement IMF-endorsed electricity industry reforms (Bank, 2023). The main objective of this study is to investigate the impact of inventory policies on corporate social responsibility (CSR) practices in Jordanian businesses in Jordanian companies listed on the Amman Stock Exchange (ASE). The companies chosen for the present research belong to the manufacturing sector because this sector requires significant investment in inventory. For this reason, we excluded the financial and purely services-based companies. The financial data required for the present research consisted of 45 companies and was extracted from the ASE website for the period from 2012 to 2022. The financial data of the Jordanian companies was extracted from the audited financial statements of Jordanian companies.

The remainder of the paper is organized as follows. Section 2 consists of a literature review and gap identification, followed by the development of a research hypothesis and statistical model for testing these hypotheses. The third section consists of an explanation of the data and variables used to test the research hypothesis. The fourth section consists of statistical analysis and results, along with a detailed discussion of the results. The fifth section consists of the study's conclusion and its research implications and limitations.

2. LITERATURE REVIEW

Corporate Social Responsibility (CSR) reporting has gained popularity among Jordanian businesses in recent decades. These suggestions define generally accepted principles, rules, and methods to facilitate global CSR adoption. (Törnqvist & Kilstam, 2021) Suggested that enterprises investigate the benefits of Corporate Social Responsibility (CSR) in inventory management. Given its impact on the local society, shareholders must fight for management to embrace Corporate Social Responsibility (CSR). However, CSR declaration in Jordan is voluntary (Vries, Tummers, & Bekkers, 2018). Few studies have examined how corporate social responsibility (CSR) factors like philanthropy, community participation, and environmental activities affect company performance. According to (Ananzeh, Shbail, Amosh, Khatib, & Abualoush, 2023), Jordan has a significant research gap. CSR literature uses various theoretical frameworks. The literature frequently cites the agency theory (Freeman & Phillips, 2002), stakeholders' theory (Harjoto & Jo, 2011), institutional theory, and legitimacy theory. The Stakeholder Theory, which underpins Corporate Social Responsibility (CSR), maintains that corporations should prioritize non-shareholder stakeholders. Businesses can benefit from stakeholder theory by better understanding stakeholder expectations for their projects (Moneva, Rivera-Lirio, & Muñoz-Torres, 2007). The stakeholder theory shows why corporations should participate in corporate social responsibility (CSR) (Ali, Frynas, & Mahmood, 2017; Sial, Chunmei, Khan,

& Nguyen, 2018; Sial, Zheng, Khuong, Khan, & Usman, 2018). (Friedman, 1956, 1962). Corporations and individuals donate to corporate philanthropy. With the rise of enterprises in our daily lives, interest in the economy and its social impacts has grown (A. B. Carroll & Buchholtz, 2015). Thus, stakeholders view corporate philanthropy as moral. Implementing corporate social responsibility (CSR) initiatives helps stakeholders, who are principals, review how well managers are serving their interests. CSR procedures help stakeholders assess an organization's management (Carroll & Buchholtz, 2015). (Clement, 2005) defined LT as a "social contract" between a business and its community that benefits both parties. This social contract assesses a company's business activities against society's standards and expectations. As a company's joint obligation to society, corporate social responsibility (CSR) information must meet numerous stakeholders' expectations. Through employee engagement in corporate social responsibility (CSR) projects and reporting of results, managers are motivated to justify their actions over time. According to (Boaz, Hanney, Borst, O'Shea, & Kok, 2018), firms will do whatever to maintain their reputation as legal entities with valid goals and methods. Several researchers have shown that the legitimacy theory (LT) can explain corporate social responsibility (CSR) activities in different circumstances (Deegan, 2002). No direct association between corporate social responsibility (CSR) practices and improved company performance shows that past research has primarily disregarded the impact of CSR activities on business success. Most academic research on corporate social responsibility (CSR) reporting has used Legitimacy Theory (LT) to justify and satisfy stakeholders. Corporate Social Responsibility (CSR) activities enhance the investigation by portraying business performance as a respectable pursuit. Many scholars have used stakeholder theory to frame corporate social responsibility (CSR) efforts. It means corporate social responsibility (CSR) may improve business performance. Communication with various stakeholders is crucial to a company's success. To ensure stakeholders' interests are protected. Leadership Theory's social contract emphasizes continual communication between organizations and stakeholders. According to LT, corporate social responsibility (CSR) can boost production and revenue by promoting resource efficiency (Belal & Owen, 2007). Corporate generosity and inventory management are linked, according to empirical investigations. In the US, (Vries et al., 2018) analyzed corporate donation and inventory policies. Panel data from 817 Taft Corporate Giving Directory organizations showed a positive correlation between the two variables. Chinese public-exchange businesses' corporate philanthropy and inventory management are positively correlated (Wang, Yi, & Li, 1998). Bhattacharyya and Rahman (2019) found that charity giving benefited Indian enterprises.

2. 1. CSR ADOPTION AND JORDAN

Businesses giving back to their communities isn't new. Businesses have cared for the community for ages (Jonek-Kowalska & Zielinski, 2020). When writers began writing on firms' social performance and CEOs in the 1930s and 1940s, they began discussing their social responsibilities. Corporate Social Responsibility (CSR) and company ethics have changed over the years. Companies listed on the Amman Stock Exchange (ASE) are required to provide particular information regarding corporate social responsibility (CSR) in their annual reports under exchange rules (Archie B. Carroll, 2016; Garcia-Sanchez, Cuadrado-Ballesteros, & Frias-Aceituno, 2016). The collection documents the company's volunteer, environmental, and charity efforts. Given the complexity and diversity of corporate social responsibility (CSR), disclosure constraints are necessary. It is not easy to assess the impact of corporate social responsibility (CSR) on a Jordanian company's management because there are few CSR processes. Clear and understandable language distinguishes the disclosures (Dat, Dai, & Bich, 2022; Spence, 2016). Corporate social responsibility (CSR) data helps firms. Companies can improve their public

image by inflating their corporate social responsibility (CSR) disclosures, even if their CSR performance is poor (Harjoto & Jo, 2011). Companies can still profit from CSR assurance even if they don't perform well in terms of corporate social responsibility (CSR) (Stojanovic, Puška, Ozbalci, & Bolek, 2023; Törnqvist & Kilstam, 2021). Legitimacy theory is the finest sociopolitical framework for understanding how firms choose corporate social responsibility (CSR) information. The present body of scholarly literature suggests that corporate social responsibility (CSR) programs and the performance of developing nation enterprises are understudied (Magbool, 2015). The relationship between corporate performance and CSR in Jordan has been studied by (Abu-Rumman, 2018; Al-Abbadi, Almomani, Rumman, Abu-Rumman, & Khraisat, 2019; Qa'dan & Suwaidan, 2018). The overall analysis of the literature indicates that Jordan's stakeholder involvement in corporate social responsibility (CSR) has grown. Several companies have shown great dedication to social and environmental benefits, according to (Rettab, Brik, & Mellahi, 2009). However, the companies still view corporate social responsibility (CSR) as a philanthropic model rather than a strategic strategy for long-term sustainability. The legislative and economic viewpoint on corporate social responsibility focuses on how firms understand their contracts about rights and duties. Corporate, government, and social entities are included in this approach. Shareholders invest in a company because they believe they are getting something in return. Recognizing that firms should maximize shareholder value resulting in recognizing the company's promise to manage and conduct the business best to serve investors' interests in exchange for their investment.

2. 2. MODERN INVENTORY MANAGEMENT

Modern inventory management may have originated with businesses and merchants. Before the Industrial Revolution, supply chain management was outdated and limited. Retail procurement decisions were based on hurriedly created documentation and subjective judgment. Retailers spent hours or days hand-counting and auditing their inventory for abnormalities. The modest size of activities makes it hard to prioritize efficiency improvements. The Industrial Revolution boosted production and lowered prices. The consumer goods business grew as more individuals had money to buy items. Demand for goods increased as disposable income increased. Businesses carefully evaluate mass production and point-of-sale customer happiness (Civelek, 2017; Nguyen & Ngo, 2022).

Harvard University created the first completely automated checkout system in the 1930s. Punch cards simplify stock inventory and client order billing. This method allowed customers to complete punch cards, which were scanned by a computer and transferred to storage (Lockard, 2012). Early barcodes were invented in the 1940s and 1950s. Unfortunately, technology had advanced slower than expected. The equipment proved unwieldy and inefficient. In the 1960s, firms started employing barcodes for this. Laser technology makes scanners cheaper and faster. The first barcode, or UPSC, was invented in the late 1960s. Marsh stores in Troy, Ohio, had the first barcode scanning incident on June 26, 1974 (Dolinsky, 2022).

Before personal computers and sophisticated software became extensively used in the 1990s, inventory management was challenging. Multiple checks, stock tracking, and purchases are common. Barcodes and barcode scanners have become cheaper as personal computers have grown. Barcode inventory management solutions were tough to implement by small and medium-sized firms since there was no central data storage. Scanning and input data have replaced manual tracking, making handwritten records obsolete. In the early 2000s, barcode scanners and other inventory management software became extensively adopted, saving firms time and labor (Elsayed, 2014). Despite the 1970s patent filing for radio-frequency identification, the

technology was not widely employed until the 2000s. Microchips can retrieve manufacturers, product categories, and serial numbers (Molnar & Wagner, 2004). Consider a barcode with extra features. RFID tags can strategically be placed on shelves in remote warehouse areas to improve reading. A barcode's data storage is limited. Every company needs effective inventory management (Bose, Lui, & Ngai, 2011; Staniewski, Awruk, Leonardi, & Słomski, 2024).

2. 3. STAKEHOLDERS AND INVENTORIES

(Brammer & Millington, 2003) held that stakeholders often decide what to do without thinking about it first, which could cause them to pick the wrong policy. In today's fast-paced and competitive business world, industrial companies need to make their operations more effective and efficient as the behavior patterns of producers, distributors, wholesalers, and retailers tend to change with circumstances (Subagyo, 2017).

Wholesalers, sellers, and distributors are required to make informed estimations on the quantity of each product variant that should be dispatched to the subsequent entity within the supply chain. According to (Kurniawan, Komara, & Setiawan, 2019), the dimensions of objects inside each hierarchical level would undergo modifications over some time, prompting players to adapt their behaviors to the altered surroundings. It is imperative to consider the patterns of behavior exhibited by stakeholders when making decisions on allocation and inventory management. The supply chain is comprised of several entities, including producers, merchants, wholesalers, and distributors, who are involved in the transportation and distribution of a diverse variety of items (Finch, Goehring, & Marshall, 2017). These groups select routes based on criteria such as reduced travel times or lower costs. The selection between train and road transportation exemplifies the typical behavior of stakeholders.

According to (Wuttichindanon, 2017), stakeholders typically establish a threshold for the extent to which specific items can be distributed. At every tier of transportation, there exists a finite quantity of automobiles possessing varying capacities. Various stakeholders employ a range of vehicles of varying sizes, including larger, medium-sized, and smaller ones, to minimize the reliance on cargo trucks and facilitate the transportation of dropping loads. The individuals involved in the examination of consumer car selection encompass several stakeholders, such as manufacturers, distributors, wholesalers, and retailers. There exist multiple mathematical models that are utilized in the field of logistics and supply chain management. In the context of these methodologies, it is commonly posited that the active participation of stakeholders is anticipated. Several studies have identified mathematical models that fail to consider corporate human biases (Al-Okaily, Al-Okaily, Al-Mawali, & Tan, 2021; Dmaithan Abdelkarim Almajali et al., 2022). Certain limits arise due to the tendency of stakeholders to select specific routes and modes of transportation. Singh et al. (2019) have identified certain analytical methods that incorporate the biases of stakeholders. However, the existing literature lacks comprehensive research that provides a formal mathematical model or heuristic approach to address this issue. Researchers such as (Diaz, Bailey, & Kumar, 2016; Elsayed, 2014) have developed optimization models to address supply chain challenges. The individuals engaged in a discussion regarding the financial ramifications associated with failing to satisfy customer demand, highlighting the significance of appropriately forecasting demand. The complexity of supply chain networks arises from the multitude of products and transportation options available (Sun L, Zhao Y, & W, 2020). It necessitates a reevaluation of their examination of a singular product and mode. Recent scholarly research has examined complex supply chain networks that encompass extensive temporal durations, many categories of commodities, and multiple hierarchical levels (Yin F et al., 2021). The topic of transportation decision-making is not extensively discussed in the

literature. It is imperative to consider the desires and requirements of transit users. The study conducted by (Rothenberg, Hull, & Tang, 2017) revealed a correlation between a firm's capacity to attract and retain high-performing employees and its commitment to social responsibility. The social obligations encompass various provisions such as remunerated time off, healthcare coverage, educational assistance, and more societal benefits, alongside the provision of stock options. According to (Crane, Matten, & Spence, 2008), the implementation of more effective human resource management solutions is associated with improved outcomes in inventory management. The decrease in inventory levels can be attributed to increased efficiency (A. B. Carroll & Buchholtz, 2015). The necessity of emergency supplies could potentially be mitigated by enhanced dedication, talent, and motivation among individuals. Meeting client demands and maintaining low inventory levels might pose challenges if an organization fails to prioritize quality and neglects to invest in quality-focused technologies (Benmoussa & Jarašūnienė, 2022). According to (Song & Song, 2009), it is incumbent upon all employees to enhance the production cycle, uphold quality control measures, identify underlying reasons, and generate effective resolutions. Employers have the potential to enhance employee engagement through many strategies, such as facilitating skill development, fostering teamwork, encouraging open communication, and granting a substantial degree of autonomy within the workplace (Qi, Huo, Wang, & Yeung, 2017).

2. 4. INVENTORIES AND CORPORATE SOCIAL RESPONSIBILITY

In the next section, we'll use these theoretical bases to show how an organization's inventory policy is related to how well it does with social responsibility. (Suleman Bawa, George Effah Asamoah, & Ernest Kissi, 2018)Had held that shareholder pressure is what drives corporate social responsibility. (Villiers, Kuruppu, & Dissanayake, 2021) Put environmental tactics into two groups: those that stop pollution and those that make sure rules are followed. Environmental rules are not welcomed by businesses that focus on compliance. Instead, they focus on quick ways to cut down on pollution at the end of the industrial process. The new climate policy goes beyond what is required. Instead, a planned approach using better tools to get rid of pollution where it starts is favored (Cherian et al., 2020; Parker, 2005; Wei, Sial, Haider, & Matac, 2023). M. Sial et al. (2018) makes a distinction between financial resources that focus on protection and those that focus on compliance. Adopting technology that neutralizes waste after production is important for following the rules. These systems only deal with getting rid of trash after it's been made. They don't help with making things or giving services. (Klassen & Whybark, 1999) Held that preventative measures can lessen the damage that manufacturing does to the environment, especially when it comes to trash and pollution. Getting rid of inventory is linked to protecting the earth. Parts and component loss can be cut down with good inventory management (Sepehri, 2021). Chen, Wan, Quan, and Sial (2020) held that both workers and environmental groups want businesses to act honestly. Different companies have different ideas about how important and useful stakeholders are in deciding their corporate social responsibility (CSR) efforts (Karim et al., 2022). Because of this, companies use a range of techniques to handle their different client groups. How these differences are explained depends on how much support a company needs from different types of interest groups. Firms probably won't be able to meet all customer standards because of this (Moneva et al., 2007). Because of this, the company thinks it needs to stay out of the worries of its stakeholders as much as possible. The accommodating approach calls for people in power to take the initiative to deal with and solve problems that stakeholders bring up. Last but not least, being proactive about problems that affect stakeholders means figuring out what they want and leading a company-wide effort to get it (A. B. Carroll & Buchholtz, 2015).

Businesses become more engaged and socially responsible when they keep an eye on what their customers want. When customers think about social problems when they buy something, it changes how the business does, especially as people become more aware of social and environmental issues (Elias, 2019). Much research has shown that customers affect how businesses act in social situations. Consumer demand shapes ethical and environmentally friendly business practices, which in turn shapes a company's social responsibility stance (Gaspar, Massa, & Matos, 2005). Corporations are increasingly caring about things that aren't covered by their inventory rules, which shows a growing sense of social responsibility. A proactive company meets the wants of all stakeholders, not just a few (Boaz et al., 2018). Companies that don't follow through with their corporate social responsibility (CSR) usually put customer satisfaction first. Better CSR compliance shows that you care about all of your stakeholders (Groening, Ngoh, & Luchs, 2022).

2. 5. RESEARCH GAP

The main objective of this study was to investigate the impact of inventory policies on corporate social responsibility (CSR) practices in Jordanian businesses. The focus of our study was directed toward manufacturing organizations due to the significant impact that inventory quantity has on their overall strategic approach (Barcos, Barroso, Surroca, & Tribó, 2013). The scarcity of scholarly investigations pertaining to the topic can be ascribed to its atypical characteristics, notably within the context of Jordan. The situation mentioned above necessitated the initiation of our research, in which we took into consideration both the historical and contemporary aspects of corporate social responsibility (CSR) and inventory management. This study extends its investigation by empirically examining the proposition that the efficiency of programs aimed at enhancing worker, customer, and environmental satisfaction may be quantified by sales metrics.

2. 6. RESEARCH HYPOTHESIS

Hypothesis 1: A company's entire inventory management procedures will improve if it implements CSR practices to raise customer satisfaction.

Hypothesis 2: A company's overall inventory management procedures will improve if it implements CSR techniques to raise employee happiness.

Hypothesis 3: A company's entire inventory management procedures will be significantly impacted if it employs CSR measures that improve customer satisfaction.

Hypothesis 4: An inverted U-shape curve, which represents the underlying relationship between CSR and inventory management techniques, will be present for the organization that implements CSR practices.

The answer to this matter will enhance the decision-making process for strategic and tactical inventory management. Therefore, experts are capable of guiding the results of stakeholder engagement strategies. Gaining insight into the influence of corporate social responsibility (CSR) on stock levels has the potential to enhance inventory management systems. The primary finding suggests that corporate social responsibility (CSR) has an impact on the ratio of inventory to sales. Instead of exhibiting a linear relationship, the correlation demonstrates a U-shaped pattern. It has been observed that companies exhibiting lower levels of social responsibility tend to exhibit larger sales-to-profit ratios. However, individuals who exhibit proactive behavior tend to have a lower percentage. This link consists of two components. Companies experience varying levels of pressure from stakeholders based on their investment in the performance of the

inventory system. Businesses experience pressure from customers to expand their stock levels. However, employees do not exert the same level of influence. Companies are facing increasing pressure to decrease their inventory due to various environmental and external reasons. One additional justification for the hypothesized U-shaped relationship between corporate social responsibility (CSR) and corporate inventory is the notion that stakeholders' behavior and actions may transform responses to the introduction of socially responsible policies. At each level, stakeholders possess varying degrees of influence over company decisions. It implies that corporate social responsibility (CSR) actions of firms are directed towards key stakeholders who play a crucial role in their achievements. We recommend that elevating corporate social responsibility (CSR) levels enhances the significance of customers, whereas reducing CSR levels amplifies the relevance of stakeholders.

3. DATA AND RESEARCH MODEL

3. 1. DESCRIPTION OF DATA

We test these relationships between the relationship between inventory policies and CSR practices on the inventory management of Jordanian companies listed on the Amman Stock Exchange (ASE). The companies chosen for the present research belong to manufacturing and sectors that require significant investment in inventory. For this reason, we excluded the financial and purely services-based companies. The financial data required for the present research consisted of 45 companies and was extracted from the ASE website for the period from 2012 to 2022. The financial data of the Jordanian companies was extracted from the audited financial statements of Jordanian companies. After adjusting for missing values and absence of data, the actual number of observations was 495.

3. 2. RESEARCH MODEL

We developed the following research model based on the review of existing literature and keeping in view the nature of the data.

$$Inventory\ to\ CGS_{it+1} = \beta_0 + \beta_1 C.S.R._{it} + \beta_2 C.S.R._{it}^2 + \beta_3 Sizeoffirm_{it} + \beta_4 MarginGP_{it} + \beta_5 InventoryLeadTime_{it} + \beta_6 SaleGrowth_{it} + \beta_7 GearingRatio_{it} + \beta_8 Sigma_{it} + \sum_{S=1}^{9} \beta_{8+s}\, Dummy_{Sit} + \sum_{T=1}^{10} \beta_{17+T}\, Dummy_{Tit} + \acute{\eta}_i + \acute{\varepsilon}_{it} \quad (1)$$

In the model, the variable t is used to denote the temporal aspect, while the variable i is employed to represent the distinct information pertaining to each organization. Temporal dummy variables, denoted by the Dummy Sit- (1-digit SIC code), are employed to enhance the model's validation and facilitate the statistical analysis, hence enabling a deeper understanding of the various business categories comprising the sample. Given that the specification includes quadratic effects on Corporate Social Responsibility (CSR) for testing purposes, we opt to employ linear regression with a logarithmic transformation as opposed to a multiplicative approach. The fourth proposition. To derive the estimating equations for testing purposes, it is necessary to follow a certain procedure. In the present study, we replaced the concept of complete corporate social responsibility (CSR) with three distinct dimensions: Customer CSR, Employee CSR, and Environmental CSR, as outlined in Hypotheses 1, 2, and 3. The initial problem of endogeneity is acknowledged, wherein the potential association between the term and changes in a company's dedication to social responsibility is recognized. The degree of risk aversion among managers, for instance, has an impact on the formulation of a company's socially responsible plan as well as the investment strategy that determines inventory levels. The presence

of a firm-specific error term (i) leads to a misleading positive association between inventory investment and corporate social responsibility (CSR). In order to tackle this matter, a technique based on distinctions is employed. The error term's non-firm specific component (i) is associated with the second endogeneity issue of reverse causality. Contemporary software solutions have the potential to assist enterprises in effectively managing their inventories. Consider a hypothetical situation wherein enterprises display a strong inclination towards the adoption of this state-of-the-art technology. Given the necessity for enterprises to prioritize stakeholder satisfaction and establish confidence within their workforce about the implementation of new inventory regulations, it is anticipated that corporate social responsibility (CSR) will become intricately linked with stockpiling practices. The GMM model was employed for the estimate, following the methodology outlined by (M. A. Arellano & S. R. Bond, 1991). To mitigate any endogeneity concerns, we incorporated several time lags for the presumed endogenous factors, namely corporate social responsibility (CSR). The presence of fixed effects poses a significant constraint on the extant body of literature due to the great diversity of organizations and factors under investigation. The challenge was successfully addressed as the equation was found to be applicable to the differences through the use of the Generalized Method of Moments (GMM). According to (M. Arellano & S. Bond, 1991), the use of GMM has been found to enhance the overall effectiveness of the model. Given that GMM encompasses a set of equations pertaining to time, it can be employed to forecast appropriate lag values for both endogenous and exogenous variables within a study framework.

3. 3. DESCRIPTION OF VARIABLES

The inventory to cost of goods sold (CGS) ratio is employed as a statistic for comparative (M. A. Arellano & S. R. Bond, 1991) analysis of enterprises. Hence, we suggest that quantifying it would be advantageous. Corporate Social Responsibility (CSR) holds significant importance within our theoretical framework due to its substantial explanatory capacity. The control variables included in this analysis included firm age, capital structure, size (measured by the natural logarithm of firm assets), the ratio of cost of goods sold (CGS) to inventory, and the ratio of inventory lead time sales to CGS (Salmi & Martikainen, 1995). The model utilizes companies' ESG scores as a proxy for other variables related to corporate social responsibility (CSR). Stakeholders encompass a range of entities, such as consumers, employees, the environment, the community, and corporate governance (Elsayed & Wahba, 2013).

The score is derived from a cumulative aggregation of values that reflect the significance attributed to these perspectives. The disparity between a firm's strengths and concerns pertaining to each stakeholder, as indicated by a range of factors, is employed to ascertain the appropriate approach to corporate social responsibility (CSR) for each stakeholder (Groening et al., 2022). Given the established standards, an examination of corporate social responsibility (CSR) can be conducted by analyzing the company's interactions with its customers, employees, and the natural environment. Our analysis incorporated the inclusion of corporate social responsibility (CSR) initiatives that specifically target environmental improvement. As a result of the resemblance between corporate social responsibility (CSR) practices in the community and CSR practices in the environment, a distinct investigation into the impact of CSR in the community on commercial inventory has not been undertaken. The hypothesis for (1), (2), and (3) can be made. The social responsibility measures have undergone rescaling in order to eliminate potentially misleading outliers and achieve measurement standardization. It is important to note that the differentiation between possessing strength and demonstrating concern for multiple stakeholders constitutes the essence of social responsibility. The asset size of an organization serves

as a reliable indicator of its "Size," which is one of the control variables. The assessment of how diversity impacts the cost of keeping items is contingent upon the number of divisions inside larger firms. The concept of "gross margin" refers to the residual profit obtained by subtracting the cost of goods sold from the total revenue generated from sales. The statistic presented by (Koumanakos, 2008b) unveils the financial detriment resulting from inadequate inventory. The increase in the cost for individuals below the legal age is directly proportionate to the gross margin. To conduct a comparative analysis of profitability indicators, one should consider the gross margin as a suitable indicator. The gross margin is advantageous since it eliminates non-cash charges such as amortization and fixed expenses, including rent, utilities, and taxes (Silver, 2008). The debt-to-equity ratio is a valuable metric for assessing a company's financial well-being as it has the potential to provide insights about the availability of stock (Koumanakos, 2008b). Let us regard this as the opportunity cost associated with investing in stocks. An additional alternate statistic for measuring growth is the year-over-year percentage increase in sales, sometimes referred to as "Sales Growth." Their study (Elsayed, 2015)introduces a methodology for evaluating demand uncertainty by using the standard deviation of residuals and the lagged value of sales. The model parameters are utilized to reduce the mean squared error. The statistical analysis aims to assess the impact of diversification on inventory storage costs, as larger firms tend to possess a greater number of divisions. The term "gross margin" pertains to the residual amount of revenue remaining after subtracting the expenses associated with the sale of products. According to (Flores et al., 1992), this metric illustrates the financial detriment resulting from inadequate inventory. The gross margin directly influences the magnitude of the underage fee increment. The preference for gross margin over other definitions, such as net margin and gross margin, stems from its exclusion of non-cash charges like amortization, as well as non-variable expenditures, including rent, utilities, and taxes (Silver, 2008). The debt-to-equity ratio is commonly employed as a predictive measure for inventory levels. Hence, we consider it to serve as an indicator of a company's financial framework (Koumanakos, 2008a). This element pertains to the opportunity cost associated with the acquisition of inventories. The annual percentage rise in sales, sometimes referred to as "Sales Growth," represents an additional potential signal for expansion. According to (Salmi & Martikainen, 1995), a method is proposed for assessing demand uncertainty by utilizing the standard deviation of residuals, followed by the utilization of lagged sales values for sales projection. The utilization of these model settings leads to the attainment of the minimum mean squared error.

4. RESULTS AND DISCUSSION

All the variables included in the research exhibit a statistically significant confidence level of 95%. Based on the statistical results, there exists a positive Spearman correlation of 53.91 percent between customer Corporate Social Responsibility (CSR) and the inventory-to-sales ratio. At the same time, there is no significant correlation observed between either the aggregate Corporate Social Responsibility (CSR) or the individual CSR components such as environment, and employees to-sales ratio. To make sure the study's results are correct, we also found the key parts of the overall corporate social responsibility (CSR) value that can be given to CSR for customers, CSR for the environment, and CSR for employees. We look at two possible outcomes. In the first, observations have CSR ratings that are in the top quarter of the distribution. In the second situation, on the other hand, observations have CSR ratings that are in the lower half of the range. The details of these descriptive statistics is presented in Table 1.

Table 1. Spearman Correlations for the Variables

	Mean	DS	Min	Max	Inv to CGS	CSR	CSR Customer	CSR Employee	CSR Environment	Firm Size	Gross Profit Margin	Inventory Lead Time	Growth in Sales	Gearing Ratio
Inv to CGS	0.34101	1.54224	0	138.646809	0.81	1								
CSR	9.5613	2.61087	0.87	26.1	-0.02523	0.87	1							
Customer CSR	3.6081	0.5391	0.9	6.3	0.0531	0.324	0.9	1						
CSR Employee	3.71553	0.81718	0.91	8.19	0.02548	0.45591	0.18109	0.91	1					
CSR Environment	5.3489	0.61944	0.89	8.9	-0.05251	0.44589	0.13795	0.04361	0.89	1				
Firm Size	6727.611321	31955.14717	0.188679245	752196.2264	0.021132075	0.081509434	0.003773585	0.026037736	-0.076226415	0.377358491	1			
Gross Profit Margin	0.14703	7.05831	0	0.87	0.4263	0.17487	0.07569	0.07047	-0.06003	0.15399	0.87	1		
Lead Time	149.03295	1599.9594	0.49077	2127.8016	0.3198	-0.02337	-0.1968	-0.0246	-0.1722	0.63099	0.492	1.23	1	
Growth in Sales	0.47479	30.26174	-0.64622	2923.869	-0.02291	0.06715	-0.03081	-0.03081	0.0316	-0.0395	0.0948	0.05451	0.79	1
Gearing Ratio	57.0931	71.2861	0	2900.3595	-0.2755	0	-0.5605	-0.04275	0.0855	0.07315	-0.304	0.019	-0.1881	1
σ	3626670.43	23765500	0.078225	70849500	-0.029055	0.12665	0.03725	0.088655	-0.10281	0.70924	0.0745	0.30992	-0.066305	-0.00745

Source: Author's Analysis

According to our data, the significance of customers as stakeholders diminishes with the expansion of corporate social responsibility (CSR). At the outset, customers were deemed the most significant stakeholders, accounting for 30% of the overall importance. Upon the culmination of the Corporate Social Responsibility (CSR) process, it was determined that customers held the lowest level of relevance as stakeholders, accounting for a mere 15% of the overall proportion. The percentage of natural contributions exhibits a substantial rise, increasing from 25.7% to 35.0%, while the growth in human contributions is low. The data supplied supports the proposition that when corporate social responsibility (CSR) values rise, the importance of customers' concerns decreases relative to those of other stakeholders, such as environmental groups. This research investigates the relationship between corporate social responsibility (CSR) expenditures and sales, as well as the underlying notion of corporate social responsibility. The main objective of our study is to analyze the correlation between corporate social responsibility (CSR) and the ratio of CSR expenditures to sales, which exhibits a curvilinear relationship in the form of an inverted U-shaped pattern. The results of our inquiry suggest that the implementation of corporate social responsibility (CSR) influences the perceived importance of stakeholders. The findings of our research demonstrate a discernible change in the perceived significance of stakeholders, particularly with regard to customers. In the past, customers were accorded the utmost significance, as evidenced by a rating of 30%. Nevertheless, our research findings indicate that clients have been assigned a diminished level of significance, as seen by a rating of 15%. While the level of human contributions remains essentially unchanged, there is a significant rise in natural contributions, which climbed from 25.7% to over 35% of the overall amount. The results suggest that giving higher importance to a company's corporate social responsibility (CSR), perspectives should be prioritized over the concerns of its customers, namely those who share values with environmental organizations. The following section will clarify how this discovery creates a correlation between the inverted U-shaped relationship that exists between corporate social responsibility (CSR) and the allocation of resources towards CSR efforts in relation to sales. Please refer to Table 2 for nonlinear relationship.

Table 2. Non-Linear Relationship Between Corporate Social Responsibility (CSR) and the Sales Ratio

	Data Point With a Lower CSR Than The Mean	Data Point With a Greater CSR Than The Mean	Total of Means (P >|T|)
Weight of Customers	0.36206	0.332992	14.1212 (0.000)
Weight of Employees	0.24794	0.2744	-18.5122 (0.000)
Weight of Environment	0.28914	0.28361	4.95 (0.100)

Source: Author's Analysis

The ambiguous values within the brackets are contingent upon whether the CSR exceeds or falls short of the mean value of the distribution.

The table comprises multiple columns that delineate distinct categories, namely CSR consumers in Column 2, CSR workers in Columns 3 and 4, and the CSR environment in Column 5. In our subsequent analysis, completed goods and raw materials are categorized distinctly.

The results of our study suggest that customer preferences have a substantial impact on the quantities of finished goods inventory, resulting in favorable outcomes. Conversely, the impact of environmental awareness primarily leads to a decrease in the inventory of raw resources. The findings of the study model, with the exclusion of the quadratic factor, are displayed in Table 3.

Table 3.Relative Inventory Level Contingent on Different Stakeholders

Variables	Inv to CGS (t+1)	Inv to CGS (t+1)	Inv to CGS (t+1)	Inv to CGS (t+1)
CSR	-0.042 -0.636			
CSR Customer		0.180*** -3.99	0.177*** -5.003	0.196*** -2.986
CSR Employee			0.016 -0.799	0.043 -1.42
CSR Environment				-0.049 (-1.794)
(exp-6) Size of firm	2. 964*** -9.98	4.012*** -10.79	4. 230*** -10.93	4.012*** -6.126
Margin GP	0.001* -1.59	0.001** -1.881	0.001* -1.596	0.001** -1.885
(exp -7) Inventory Lead time	-1.79 (-0.591)	0.21 -0.03	-0.334 (-0.095)	1.49 -0.198
(exp -5) Sales Growth	-0.591 (-0.393)	-0.892 (-0.591)	-1.19 (-0.693)	-0.581 (-0.081)
D/E A	0.001 -1.023	0.002*** -4.881	0.002*** -3.92	0.002*** -3.692
(exp-10) σ	-2.9 (-1.651)	-0.8 (-0.207)	-0.99 (-0.400)	-3.89 (-1.231)
Intercept	-0.031 (-0.1000)	-0.903 (-2.314)	-1.029 (-2.956)	-0.601 (-1.956)
Observations	**495**	**495**	**495**	**495**
F- test	596.43 (0.000)	400.12 (0.000)	501.32 (0.000)	600.40 (0.000)
AR (2) test	1.28 (0.178)	1.29 (0.188)	1.29 (0.187)	1.30 (0.178)
Hansen test	69.97 (0.160)	56.21 (0.701)	70.01 (0.392)	47.88 (0.802)

Source: Author's Analysis

The correlation between a company's Corporate Social Responsibility (CSR) and Cost of Goods Sold (CGS) to sales ratios is not necessarily negative, as evidenced by the data provided in the first column of Table 3.

The conclusions above (column 4) were obtained through an examination of a corporation's social responsibility, with particular emphasis on its engagement with different stakeholders. Firstly, it is evident that organizations that value customer satisfaction tend to maintain elevated levels of inventory in comparison to their competitors. The presence of a positive coefficient (0.196 with a t-value of 2.986) linked to Customer CSR indicates a clear relationship. The text has been revised up to this point.

If the standard deviation of the client CSR (client Service Representative) is 0.081, then the inventory-to-sales ratio surpasses 30% above its average value. The observed results align with the initial hypothesis. In addition, the coefficient of 0.043, along with a t-value of 1.42, does not exhibit statistical significance. The available data is limited in supporting the proposition that an organization's policies have a direct impact on employee satisfaction. The results of the analysis suggest the existence of a non-linear relationship, which contradicts the hypothesis put out in Hypothesis 2.

Moreover, organizations that place a high emphasis on environmental considerations demonstrate a reduced ratio of costs to sales. Based on the available data, it is evident that a divergence of one standard deviation from the mean value of 0.89 in the context of Corporate Social Responsibility (CSR) in the environment would lead to an estimated 3% rise in the inventory-to-sales ratio. As a result, the determination was taken to reject the third hypothesis.

The outcomes from the testing of Null Hypothesis 4, which postulates that there is no linear relationship between socially responsible behavior and an organization's investment, are presented in Table 4. The conventional specification model (1) has been replaced with a focus on customer satisfaction in column 1, employee satisfaction in column 2, and environmental outcomes in column 4. Please refer to Table 4 for linear relationship.

Table 4 The Linear Relationship Between Socially Responsible Behavior and an Organization's Investment

	1	2	3	4
	Inv to CGS (t+1)	Inv to CGS (t+1)	Inv to CGS (t+1)	Inv to CGS (t+1)
CSR	0.199*** -3.891			
CSR2	-0.005*** (-4.002)			
CSR Customer		0.201** -1.244		
CSR^2 Customer		0.1902** (1.99)		
CSR Employee			0.596*** (3.122)	
CSR2Employee			-0.060*** (2.995)	
CSR Environment				0.99** (-2.001)
CSR^2 Environment				-0.0300** (-1.019)
Firm Size (exp-6)	3.331***	2.445***	3.245***	3.002***
Margin GP	-8.019	-5.001	-6.321	-5.021
Inventory Lead time (exp -7)	0.001**	0.001**	0.001**	0.001*
Growth in Sales (exp -5)	-2.000	-1.211	-1.661	-2.901
Gearing	2.71	3.99	3.99	1.32
Sigma (exp-10)	-0.866	-0.7	-1.06	-0.801
Intercept	0.491	1.52	0.99	-2.32
Observations	1529	1529	1529	1529

F- test	600.55 4	200.63 4	394.59 1	120.07 1
AR (2) test	1.30 -0.200	1.29 -0.294	1.35 -0.210	1.40 -0.184
Hansen test	70.11 -0.491	41.40 -1.001	42.12 -0.894	50.03 -0.921

Source: Author's Analysis

Empirical evidence shown in Table 4 suggests the presence of a non-linear relationship between the ratio of corporate social responsibility (CSR) activities to sales. In the first column, it is noted that the positive linear coefficient exhibits a value of 0.199 (t = 3.891), but the negative quadratic coefficient is measured at -0.005 (t = -4.002). The data presented in this study demonstrates a curvilinear link, namely a U-shaped pattern, between corporate social responsibility (CSR) and the sales ratio. The study observed a maximum CSR value of 10.28. The CSR can be deemed optimal due to its minor deviation over the median value within the distribution, suggesting its close approach to an ideal value. The results produced in this study provide empirical support for Hypothesis 4.

The empirical findings suggest that there exists a positive and convex association between customers and staff, as evidenced by the positive coefficients assigned to both the linear and quadratic terms. Likewise, a positive and concave correlation may be shown between employees and the environment, wherein the highest attainable level of employee Corporate Social Responsibility (CSR) is recorded as 7.24. In contrast, the correlation between the environment and personnel has a negative and inverted U-shaped trajectory. Given the multitude of stakeholders involved, it is beneficial to analyze corporate social responsibility (CSR) by breaking it down into its fundamental components and evaluating its influence on organizational strategies. Furthermore, the analysis of Table 2 has led to the formulation of two hypotheses aiming to elucidate the non-linear relationship between corporate social responsibility (CSR) and the sales ratio. A noteworthy discovery indicates that the adoption of corporate social responsibility (CSR) initiatives is linked to a positive influence on the sales ratio. Furthermore, empirical evidence has demonstrated that there exists a non-linear association between employee happiness and an organization's policy, characterized by a concave-shaped trajectory. The data presented in Table 2 demonstrates a statistically significant decline in customer corporate social responsibility (CSR) and a notable rise in staff CSR when the overall CSR value increases. Given the extensive scope of the inquiry, it is imperative to consider this crucial facet carefully.

5. CONCLUSION

The primary aim of this research is to examine the potential influence of corporate social responsibility (CSR) initiatives on the management of inventories. The main proposition of our research posits that the association between these two variables can be graphically represented as a concave function that bears a resemblance to an inverted letter U. The relationship between a company's corporate social responsibility (CSR) and its effect on commercial inventory may be analyzed by breaking it down into a series of factors that assess the degree to which the needs and concerns of various stakeholders are met. The stakeholders consist of several entities, such as consumers, employees, and the environment, among other relevant parties. Our hypothesis suggests that firms who place a high emphasis on customer satisfaction may choose to maintain a larger number of unsold products in their inventory as a precautionary strategy to mitigate the risk of stock-outs. When employees are subjected to two opposing influences, they experience a non-linear phenomenon. Employees who exhibit a robust dedication to corporate social responsibility (CSR) are more likely to display enduring devotion to a singular firm. Therefore, firms

opt to utilize management tactics as an alternate method to mitigate demand-side interruptions in cases when labor turnover is not a viable solution.

Conversely, the adoption of just-in-time production has been observed to yield cost reductions as a consequence of the ethical behavior demonstrated by employees. The feasibility of implementing these requirements is enhanced when enterprises prioritize the fulfillment of their employees' demands and preferences. Therefore, it is possible to notice a U-shaped curve, specifically an inverted U-shaped curve, in the correlation between an employee's level of corporate social responsibility (CSR) and their level of experience. Invariably, businesses that place a higher emphasis on environmental considerations tend to provide a more limited selection of commercial products for purchase.

The findings of our research indicate the presence of a negative association between levels of customer satisfaction and the cost-to-sales ratio. A negative, inverted U-shaped correlation can be observed between the level of workers' contentment and their environmental awareness. A significant correlation was found between inventory levels and customer happiness. The presence of a non-linear relationship between corporate social responsibility (CSR) and the to-sales ratio is evidenced by the finding that an increase in CSR is associated with a decrease in customer CSR. At the same time, staff CSR exhibits an upward trend. When a company's corporate social responsibility (CSR) rating deviates significantly from the average of the CSR distribution, it frequently leads to a corresponding change in the profit-to-sales ratio. According to our research findings, there exists a negative correlation between customer satisfaction levels and the cost-to-sales ratio. The presence of environmental consciousness is found to have a detrimental effect on the ratio. In contrast, employee satisfaction exhibits a curvilinear association that an inverted U-shaped pattern can define.

5. 1. THE RESEARCH IMPLICATIONS

Numerous implications have been identified with respect to the components that exert control. It is crucial to acknowledge that a substantial correlation exists between the magnitude of a corporation and its inventory turnover. According to (Elsayed & Wahba, 2013), larger firms that offer a wider variety of items require a more extensive inventory in order to meet consumer requests effectively. Numerous scholarly investigations have been conducted to explore the correlation between the size of a corporation and its inventory levels. For example, (Ponte, Puche, Rosillo, & Fuente, 2020) conducted a study that supports the notion that larger organizations generally exhibit reduced inventory levels.

Similarly, Ponte, Puche, Rosillo, and Fuente (2020) conducted a separate study that also provides evidence for the inverse relationship between company size and inventory levels. In order to reduce the likelihood of undesirable consequences, larger firms possess the capability to consolidate demand from several geographical areas. The perceived lack of necessity for companies to possess larger holdings for security purposes is being questioned. As a result, the sample of enterprises in our study that exhibit social responsibility and low-risk characteristics has exhibited a decline in their reliance on inventories as a strategy for risk mitigation.

Incurring elevated inventory levels results in additional expenditures when striving to maintain a larger profit margin. The results indicate a significant positive relationship between higher gross margins and heightened risks, particularly in terms of expenses related to insufficient inventory management. As a result, companies tend to amass greater quantities of inventory over time (Salmi & Martikainen, 1995). Companies with a high debt-to-equity ratio often observe an increase in their inventory levels. These items are frequently employed as collateral for short-

term loans or letters of credit. Furthermore, the possible escalation in debt values, specifically within the banking industry, could potentially operate as a driving force for the pursuit of supplementary assets, as suggested by (Elsayed & Wahba, 2013).

5. 2. LIMITATIONS AND FUTURE DIRECTION OF RESEARCH

The major limitations of the present research mainly include the sample size, time, and context of the research. The sample size of the research was limited to 45 companies owing to the nature of the research in which we considered the companies that hold significant levels of inventory, such as manufacturing companies. Thus, our sample size was limited. Besides that, we were only able to include the companies for which the financial data for the research period was available. We only analyzed the companies listed on the Aman Stock Exchange. In the future, researchers can take cross-sectional data to analyze other economies using similar parameters. The researchers can also conduct similar reach on different sectors of the economy and compare their results.

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ENHANCING THE GREEN ENERGY REVOLUTION: ANALYZING THE IMPACT OF FINANCIAL AND INVESTMENT PROCESSES ON RENEWABLE ENERGY PROJECTS IN KAZAKHSTAN

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ABSTRACT

As a fossil fuel-dependent nation, Kazakhstan is caught between issues and possibilities in its search for a sustainable energy transition. Despite its tremendous resources, Kazakhstan's renewable energy capacity is 1%, much behind its non-renewable peers. According to this research, green fiscal policies in renewable energy firms are needed to reduce the country's political and economic dependence on the global oil sector. This report emphasizes regional collaboration and Kazakhstan's potential leadership in Central Asian Green Economy projects. Kazakhstan can promote renewable energy adoption and economic sustainability by forming regional alliances.

Challenges lie ahead on the green future path, so this paper addresses legislative, infrastructure, financial, and data barriers to green fiscal initiatives in Kazakhstan. It stresses the significance of holistically tackling these concerns, including banking and stock market reforms and sustainable planning. Policymakers and stakeholders in Kazakhstan can use the research findings to boost the economy, fight corruption, and increase political engagement. Upskilling the workforce to support green technology and local renewable energy production is recommended. The report recommends proactive global crisis prediction and management to help Kazakhstan handle economic and environmental challenges. Hence, the above actions are crucial to Kazakhstan's goal of industrialization by 2050. Kazakhstan can lead a world rapidly moving to green energy by committing to green fiscal methods, regional collaboration, and addressing the many obstacles to development. By doing so, it can safeguard its future and advance the global green energy revolution.

Keywords: *Kazakhstan, Green Economy, Renewable Energy, Investment, Economy Growth*

1. INTRODUCTION

Kazakhstan is the ninth-largest country in the world, with 19 million people and 2,717,300 square kilometers. It borders Russia, China, Uzbekistan, Kyrgyzstan, and Turkmenistan in Central Asia: north, east, and south. Kazakhstan's climate reflects its geographical diversity, with winter lows of -20°C and summer highs of 29°C (Kazakhstan, 1992). Southern Kazakhstan is rich in irrigated cotton, whereas the north grows wheat and millet. The large, arid central plateau is ideal for sheep and cow pasture (Kazakhstan, 1992). Kazakh reserves include lead,

nickel, petroleum, zinc, copper, iron ore, and chromium, ranking second globally in chromite, lead, silver, and uranium among the top nations for zinc, tungsten, and barite (PAGE, 2020).

Kazakhstan has had difficult economic adjustments since the 1991 Soviet Union collapse. Oil exports drove the country's 7% GDP growth in the early 2000s. GDP growth continued at 4.1% in 2018 (PAGE, 2020). After a 2.5% recession in 2020 due to the COVID-19 pandemic, the economy grew 4% in 2021 under relaxed restrictions and strong vaccination efforts (ARIC, 2022). The tourism business was devastated by the COVID-19 pandemic (Rozalia Gabor et al., 2023). External shocks, such as economic crises or pandemics, loom over sustainability and financial planning. The pandemic-induced drop in overseas visitors hurt industrial revenues and resonated across Asia, casting a shadow over Kazakhstan's economic resiliency (ARIC, 2022).

The Ukraine-Russia crisis and economic sanctions against Russia (Stepanenko et al., 2023) make Kazakhstan more vulnerable due to its large imports from its northern neighbor. Such complex relationships between businesses and the environment highlight the tight balance between sustainability and profitability. In Kazakhstan and nearby countries, the COVID-19 pandemic has shown the tourism industry's vulnerability and severe social, financial, and environmental impacts (Zhang Song et al., 2021).

Demand forecasts have altered Kazakhstan's economic sector as companies adapt their strategy. Government actions and corporate policies have helped Kazakhstan's environmental sustainability, although the tourism industry is the most vulnerable. The global pandemic showed how external variables might affect this industry, causing job losses and a drop in international visitors (Zhang, Song, et al., 2021).

Geopolitical tensions and global crises interrupt Kazakhstan's supply chain, requiring tourist firms to maximize resource use and sustainability. Kazakhstan must integrate sustainability into its enterprises to mitigate external influences and optimize commercial outcomes. The World Bank predicted 1.5%–2.0% GDP growth in 2022, but it reached 3.2%, demonstrating the nation's economic resiliency (The World Bank, 2023). Kazakhstan's energy reserves underpin its economy. Despite state, tariff, and public pricing differences, energy-intensive businesses have a technology gap. Kazakhstan requires twice as much energy as the world average to produce the same GDP (Dulambayeva et al., 2013).

The government has focused on value chains emphasizing raw material processing and R&D to boost the green economy and add value. These projects could create new opportunities while promoting sustainability (PAGE, 2020). Environmental activists and progressive governments are promoting carbon footprint reduction as worldwide awareness of carbon emissions grows. To boost renewable energy companies, international organizations are promoting energy-efficient markets, tax incentives, and green fiscal policies (Raihan & Tuspekova, 2022). However, each nation's political, economic, and social realities define its green energy goals (Selicati & Cardinale, 2023). Politically and economically, the oil industry's dominance as a non-renewable energy source is a major issue (Chien et al., 2022).

Kazakhstan and other countries with renewable energy goals must break free from the global oil industry to invest meaningfully. This requires reducing the oil industry's political and economic power to implement green fiscal measures (Saqlain, 2023). Kazakhstan pledged a "Green Economy" and renewable energy by signing the Paris Agreement in 2016 (Kalkabayeva et al., 2020). The nation established lofty goals to lower atmospheric sulfate and nitrogen oxide to European

levels by 2030. Kazakhstan plans to reduce its carbon footprint by 50% by 2050, which could improve GDP by 3% (Kalkabayeva et al., 2020).

However, implementing these groundbreaking efforts takes much work, especially financially. Kazakhstan's oil industry accounts for 50% of government revenues (Soltangazinov et al., 2020). Given its history with Russia during the 2012 energy crisis, the country's economy is unstable (Orazgaliyev, 2018). As Kazakhstan faced uncertainty, its renewable energy regulations changed significantly.

Kazakhstan, the eleventh-largest oil producer and 54th-largest landmass has the second-highest oil reserves in the world (Zhanseitov et al., 2020). The Kazakhstani economy relies on energy and mining, which account for 33% of GDP and 82% of exports (Zhanseitov et al., 2020). As governments have become more aware of renewable energy's economic potential, they have created rules to regulate energy companies in Kazakhstan (Orazgaliyev, 2018). In this study, Kazakhstan's complex attempts to boost renewable energy are examined alongside the issues facing the non-renewable energy industry, which underpins the economy. This shift requires addressing this sector's deep-rooted political and economic dependencies to move to a green energy economy.

2. LITERATURE REVIEW

This literature review explores the various dimensions of sustainable development difficulties in Kazakhstan, focusing on the renewable energy industry and alternative strategies for addressing these challenges. The literature review is structured into two distinct sections. The initial section offers valuable insights into the contextual background and associated issues. Subsequently, the second section delves into a comprehensive exploration of specific solutions addressing these challenges.

2. 1. SUSTAINABLE DEVELOPMENT CHALLENGES IN KAZAKHSTAN

Distinct ecological concerns support the goal of sustainable development in Kazakhstan. Kazakhstan is currently confronted with the enduring consequences of the Soviet era, characterized by a substantial burden of industrial waste amounting to over 23 billion tons. This includes a significant portion of nine billion tons attributed to mineral formations resulting from nuclear testing and other related activities. In addition, the country is confronted with complex water challenges, which are further intensified due to its dependence on water resources that cross national boundaries (Diyar et al., 2014).

The COVID-19 pandemic has resulted in environmental repercussions at both the global and local levels. According to Jones and Comfort (2020), there was a transient decline in environmental waste due to reduced industrial and transportation activity during the pandemic. Nevertheless, the potential long-term sustainability benefits still need to be investigated (Avunduk, 2023). The crisis has potentially undermined environmental legislation and regulations in multiple nations, which could affect endeavors towards sustainable development (Moraliyska, 2023). Sustainable development is crucial to renewing and improving the tourism sector's connections to natural and human resources (Kuzmak and Kuzmak, 2023). Government involvement is crucial in addressing travel companies' current issues. Sustainable procurement, per the United Nations' Sustainable Development Goals for 2030, enables both domestic and foreign companies to embrace sustainability activities and provide transparency on their environmental sustainability statistics (Romana, 2018). As a result, the provision of government assistance, along with the dissemination of information regarding sustainable practices, can contribute to

the harmonization of tourist firms with the nation's ecological and sustainable development objectives.

The importance of high-quality data in facilitating accurate short-term external challenge analysis and anticipation is underscored by the findings of Wang et al. (2021) in their study conducted in Kazakhstan. The significance of projecting visitor demand data becomes apparent in enabling educated decision-making within the tourism industry.

Gbededo and Liyanage (2020) propose using the Delphi simulation approach to enhance the accuracy of inadequate baseline forecasts during times of global catastrophes, such as the COVID-19 pandemic. Furthermore, the issue of addressing shared boundary water treaties with adjacent nations arises as a matter of utmost importance. The Amudarya and Syrdarya rivers, the main Aral Sea tributaries, are vital to Central Asia's water resources. The Tajikistan-born Amudarya is Central Asia's largest river, flowing 79.4 km3 annually. The river in question flows through five nations before its discharge into the Aral Sea in Kazakhstan, spanning a cumulative length of 3019 kilometers. The Syrdarya River, which has its source in Uzbekistan, traverses a comparable trajectory (Diyar et al., 2014).

In the past, particularly during the Soviet era, downstream nations such as Kazakhstan, Uzbekistan, and Turkmenistan depended on upstream nations like the Kyrgyz Republic and Tajikistan to store river water for irrigation purposes. In the context of upstream nations, hydroelectricity assumed a subordinate position, predominantly functioning as a supplementary energy resource. Nevertheless, the alteration in priority was brought about by the altering geopolitical dynamics and evolving economies that ensued after the fall of the Soviet Union. While downstream nations maintained their reliance on irrigation, upstream nations opted to convert their river water storage reservoirs into hydroelectric generating facilities. The changing geopolitical landscape of developing nations and their growing self-reliance resulted in modifications to river flow patterns and increased hydropower generation to fulfill domestic and global needs (Zinganshina, 2009).

2. 2. RENEWABLE ENERGY IN KAZAKHSTAN: CHALLENGES AND OPPORTUNITIES

The present research shifts its attention towards the renewable energy industry in Kazakhstan, with a primary emphasis on evaluating the suitability of the existing renewable energy framework and exploring viable alternative approaches. In 2009, Kazakhstan enacted legislation to encourage the utilization of renewable energy sources (Laldjebaev et al., 2021). Following this, the government introduced an extensive strategy in 2013 to shift from an economy reliant on fossil fuels to an environmentally sustainable economy by the year 2050. The interim objectives encompass increasing the green economy's proportion to 30% by 2030 and 50% by 2050. The major purpose of this framework was to construct hydroelectric facilities that are cost-effective, reliable, and ecologically friendly. According to Laldjebaev et al. (2021), a legislative reform implemented in 2017 established a set tariff structure for auction trading in renewable energy sources. This development garnered attention from prominent commercial banks and foreign investors, with participation observed from 145 entities representing 12 countries.

2. 3. CHALLENGES OF HYDROPOWER DEVELOPMENT

According to Zhakupova et al. (2021), hydropower plays a significant role in Kazakhstan's renewable energy portfolio, representing 14% of its energy sources. Nevertheless, the prolifer-

ation of hydropower encounters numerous obstacles that emphasize the necessity of assessing its appropriateness as a catalyst for the environmentally conscious revolution.

Water resource geopolitics in Central Asia are a major issue. Upstream nations like Tajikistan and Kyrgyzstan used hydropower as a supplementary energy source and supplied water to downstream nations like Kazakhstan, Uzbekistan, and Turkmenistan for irrigation. However, upstream nations' focus on hydroelectricity generation and self-sufficiency alters river flow patterns and raises concerns about downstream water supply (Zinganshina, 2009).

Climate change-induced water shortages, droughts, and desertification threaten Kazakhstan's water resources and agricultural sector (Diyar et al., 2014). The steady shrinkage of the Aral Sea, once one of the world's largest lakes, exacerbates the above difficulties. Thus, it is crucial to determine if hydropower dependence is sustainable (Diyar et al., 2014).

2. 4. EXPLORING ALTERNATIVE RENEWABLE ENERGY SOURCES

In light of the inherent challenges posed by hydropower, it is crucial to contemplate alternate forms of renewable energy that might serve as the fundamental basis for Kazakhstan's transition towards sustainability. In his work, Bozkus (2018) offers an alternative viewpoint about the renewable energy potential of Kazakhstan. The author emphasizes the significance of global energy prospects and the establishment of alliances with nations like Turkey. This collaboration aims to mitigate energy rivalry among many regional stakeholders, encompassing the European Union, several nations in Central Asia, and Russia. The study conducted by Vakhguelt (2017) examines the potential of renewable energy in Kazakhstan, providing insights into the government's initiatives to promote renewable energy projects and decrease the country's dependence on external energy sources (Bozkus, 2018).

2. 5. CONCLUSION OF THE LITERATURE REVIEW

Kazakhstan faces distinctive challenges in achieving sustainable development due to its historical Soviet past, intricate water concerns, and the worldwide ramifications of events such as the COVID-19 pandemic. Although hydropower is a substantial component of the country's renewable energy portfolio, it is important to critically assess its role in the country's green transformation due to the obstacles and geopolitical factors involved with its development. Investigating alternative renewable energy sources is seen as a vital measure in harmonizing Kazakhstan's sustainability objectives with its energy regulations. The next sections will examine Kazakhstan's precise measures and endeavors to tackle these difficulties and shift towards an environmentally sustainable economy.

3. RESEARCH METHOD

This study utilizes a rigorous research technique to thoroughly examine the intricacies of Kazakhstan's energy economy, specifically emphasizing its renewable energy sector. The research design in this study generally follows a descriptive research approach, essential for providing significant insights into the unique qualities of the many aspects examined in this study. It uses descriptive research to collect and analyze Kazakhstan's energy landscape data. Nuclear energy output, fossil fuel utilization, hydroelectric power generation, and renewable energy potential

are included. The dataset contains several Kazakhstani energy consumption, production, and per capita indicators and analyzes consumption patterns.

Exploratory data analysis (EDA) is used to study Kazakhstan's renewable energy sector's complexity and green fiscal compatibility. This involves examining secondary data sources to inform green energy and sustainable finance strategies. This study explores Kazakhstan's energy consumption and production history. Data analysis using Excel and other statistical methods was used to improve result's dependability.

3. 1. THE RATIONALE FOR SELECTING KAZAKHSTAN

The energy landscape of Kazakhstan supports its selection as the study's main emphasis. The country has abundant energy, economic potential, and geopolitical importance. Its substantial conventional and renewable energy resources offer an intriguing chance to explore a sustainable and ecologically friendly economy. Given its strategic location and complex relations with neighboring countries, specifically Russia, Kazakhstan's energy revolution is important to research. This research aims to offer significant insights with larger significance for global sustainable development by analyzing Kazakhstan's experiences and problems in implementing green fiscal policies and switching to renewable energy sources.

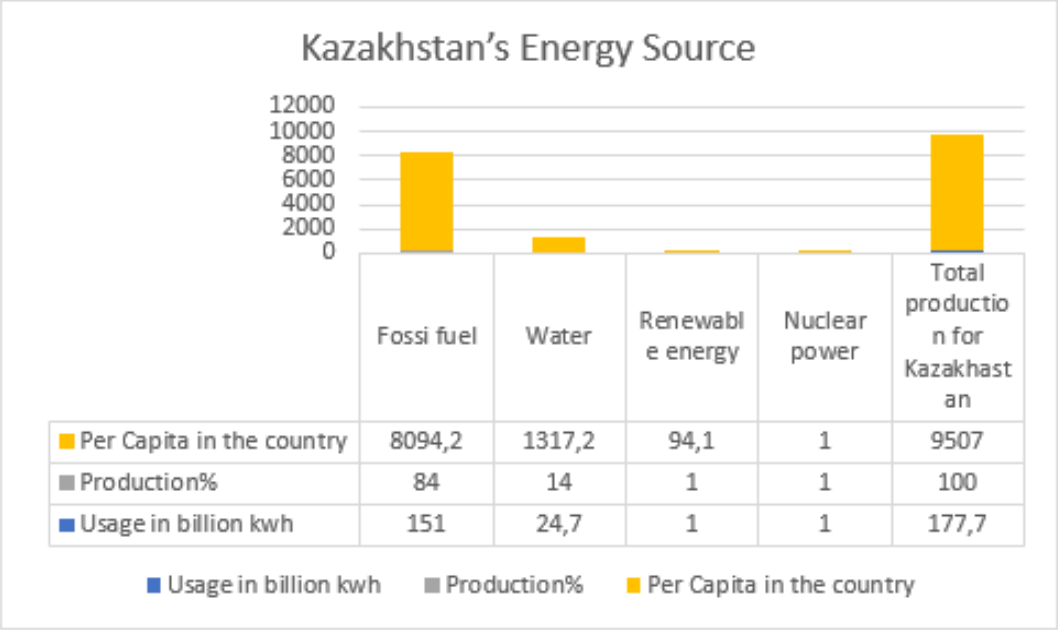
Therefore, the research methodology utilized in this work adopts a holistic strategy that integrates descriptive research methodologies with exploratory data analysis. These methodologies enable a comprehensive examination of Kazakhstan's energy landscape and its transition towards sustainability, providing insights into its unique position within the global context. The report produced by the descriptive research design is displayed in Table 1 and illustrated visually in Figure 1 below.

Table 1. Kazakhstan's Energy Source Profile

Energy Source	Usage in billion kWh	Production (%)	Per Capita in the Country
Fossil Fuel	151.0	84	8094.2
Water	24.7	14	1317.7
Renewable energy	1.8	1	94.1
Nuclear Power	1	1	1
Total Production for Kazakhstan	178.5	100	9506
Total	178.5	100	9506

Source: data calculated from https://ourworldindata.org/energy/country/kazakhstan (Hannah et al., 2022)

Figure 1. Kazakhstan's Energy Source



	Fossi fuel	Water	Renewable energy	Nuclear power	Total production for Kazakhstan
Per Capita in the country	8094,2	1317,2	94,1	1	9507
Production%	84	14	1	1	100
Usage in billion kwh	151	24,7	1	1	177,7

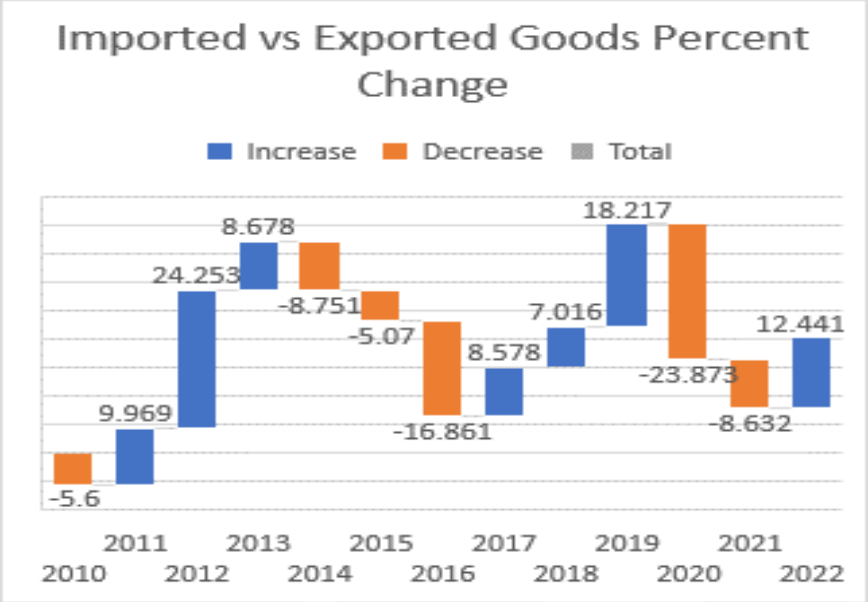
Source: data calculated from https://ourworldindata.org/energy/country/kazakhstan (Hannah et al., 2022)

Figure 2. Percent Change of Imports Visualization

Source: data calculated from https://ourworldindata.org/energy/country/kazakhstan (Hannah et al., 2022)

Figure 2 illustrates the difference between the volume of imports and exports in Kazakhstan. In recent years, imports have reduced compared to the year 2012. Exports have a lower percent change. Kazakhstan must avoid importing more than it exports to prevent trade deficits. Trade deficits lead to the decline of a country's currency value. Kazakhstan ought to strive to export more to create a trade surplus, which will ultimately benefit the citizens.

Figure 3. Volume of Imported vs. Exported Goods Percent Change



Source: From the Central Bank's newest available data: 2022, 2005, is a baseline year—weighted chain: No Trading Method: General Trade Primary or unrefined products for oil coverage. Free on board (FOB) is used to value exports. Estimating the value of imports: cost, insurance, and freight (CIF), Kazakhstani tenge is the official currency. Latest data update:03/2023

Figure 3. was plotted using secondary data from the Central Bank's newest available data: 2022 and 2005 are the baseline years—weighted chain: No Trading Method: General Trade Primary or unrefined products for oil coverage. Free on board (FOB) is used to value exports. Estimating the value of imports: cost, insurance, and freight (CIF), Kazakhstani tenge is the official currency. Latest data update: 03/2023.

Figure 3 shows that the largest increase in the volume of exports and imports was in 2012, while the largest decrease was in 2020.

4. RESULTS AND DISCUSSION

This section's results and discussion are structured around three main focal points. First, Kazakhstan's fossil fuel dependence and economic effects are examined. Second, hydropower's position as a major renewable energy source, including its limitations and potential for growth. Finally, we address electricity source restructuring difficulties and options. This structured approach aims to bring clarity and organization to the presentation of results while also improving the scientific structure of the research.

4. 1. THE DEPENDENCE OF KAZAKHSTAN ON FOSSIL FUELS AND ITS ECONOMIC IMPLICATIONS

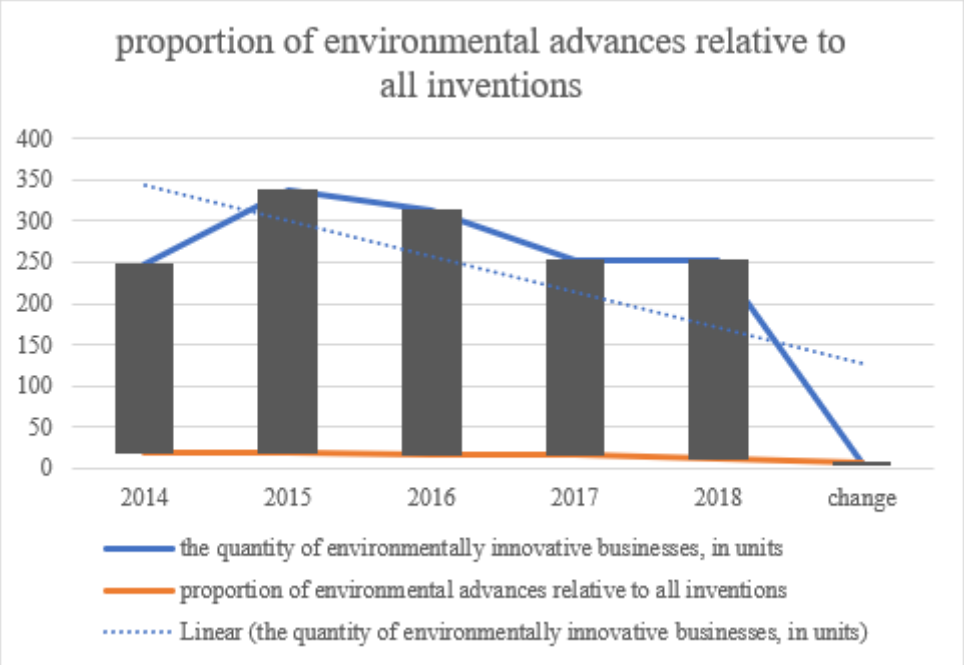
Table 1 presents an overview of Kazakhstan's energy sector, emphasizing a notable reliance on the oil industry. This sector contributes to a remarkable 86% of the country's economic output. On average, this corresponds to an energy production of 8,094.19 kWh per person. The figures highlight the significant reliance on non-renewable fossil fuels in Kazakhstan's energy composition. It is concerning that renewable energy production is currently only at 1%, leading to a per-person energy consumption of just 94.12 kWh. The excessive dependence on non-renew-

able energy sources presents economic challenges and highlights the urgency for a transition (Grabara et al., 2021).

4. 2. HYDROPOWER: LIMITATIONS AND POTENTIAL AS A LEADING RENEWABLE ENERGY SOURCE

Kazakhstan generates 14% of its energy from hydropower. It produces 1,317.66 kWh per person, second only to the oil industry. While hydroelectric generating has made important contributions, data reveals it has limitations. This finding raises crucial questions about hydropower's position in the country's greener economy and future development.

Figure 4. Proportion of environmental inventions



Source: IMF. (2022)

Figure 4 illustrates the proportion of environmental advances relative to all inventions. It is clear that the quantity of environmentally innovative businesses has significantly declined from 2014 onwards. Figure 5 paints a picture of Kazakhstan's focus on environment-friendly business activities. The visualization shows that the focus on maintaining environment-friendly businesses declined significantly. The issue of pollutant emissions in Kazakhstan can be addressed and dealt with through the implementation of green fiscal policies.

Representing Kazakhstan's energy profile reveals a disconcerting reality for the country's renewable energy industry. The situation is concerning, as seen in Figure 1's green column indicating the country's per capita measurements of various energy sources. Figure 1's most extended column, which depicts the contribution of non-renewable fossil fuels to overall output, shows the per-person energy production that is the most significant. The figure further details the nation's reliance on fossil fuels for energy. The findings also indicate that the nation produces less water power, highlighting problematic issues.

The explanation is that the region needs a lot of water power generation as a backup energy source during prolonged periods of regional electricity interruption. In addition to producing

energy, hydropower aids society by assisting with irrigation, flood control, and clean water supply.

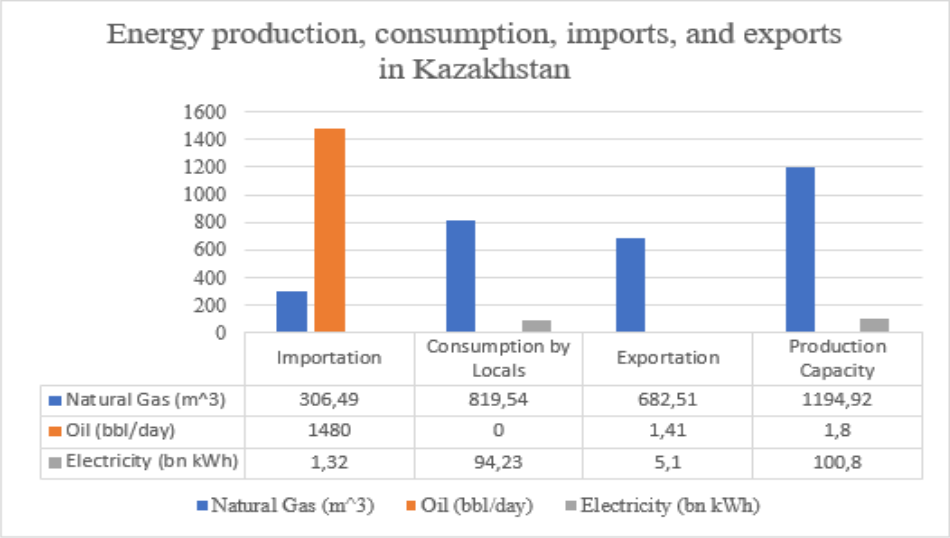
Table 2. Energy production, consumption, imports, and exports in Kazakhstan

Energy profile	Natural Gas (m^3)	Oil (bbl/day)	Electricity (bn kWh)
Importation	306.49	1480	1.32
Consumption by Locals	819.54	___	94.23
Exportation	682.51	1.41	5.1
Production Capacity	1194.92	1.8	100.8

Source: data calculated from https://ourworldindata.org/energy/country/kazakhstan (Hannah et al., 2022)

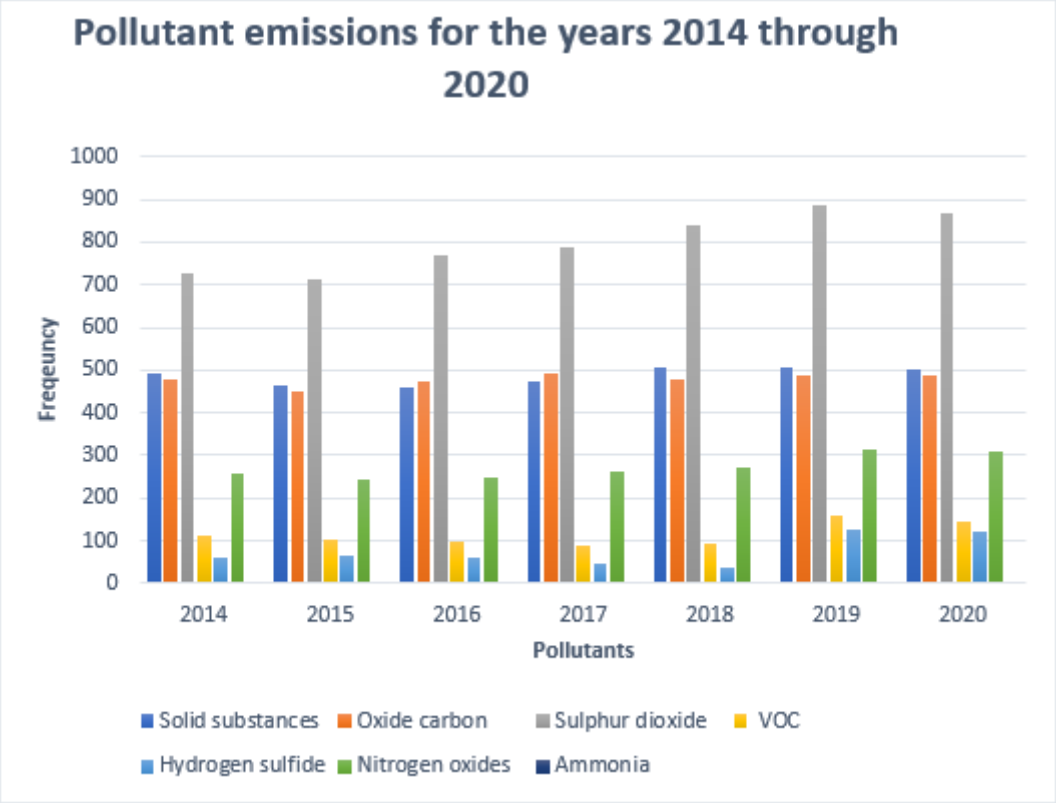
Table 2 contains data on Kazakhstan's energy profile, including statistics on the importation, local consumption, production, and exportation of common kinds of power in the country. Metrics in Table 2 demonstrate that Kazakhstan's energy sector exploration is more advanced than its importation of fossil fuels, with the statistics for electricity being the opposite. The fact that consumption is lower than output capacity across all sectors is another advantage for the nation (Dyussembekova et al., 2019). The graphic illustrates the effects on the economy because Kazakhstan is the region's largest importer of oil and also the largest user of it. The oil exports column in Figure 5 has the most extraordinary exportation. Energy production, consumption, imports, and exports in Kazakhstan are also shown graphically in this Figure.

Figure 5. Energy production, consumption, imports, and exports in Kazakhstan



Source: data calculated from https://ourworldindata.org/energy/country/kazakhstan (Hannah et al., 2022)

Figure 6. Pollutant emissions from stationary sources, in thousands of tons, for the years 2014 through 2020



Source: IMF. (2022)

Figure 6 visualizes the pollutant emissions for the years 2014 through 2020 from stationary sources in thousands of tons. From the figure, it is evident that sulfur dioxide has been the dominant pollutant through the years. Sulfur dioxide is followed by solid substances, which are followed closely by carbon oxides, such as carbon dioxide. Ammonia is the least pollutant emission.

The topic of discussion pertains to the management of carbon emissions and the control of air pollution.

The research findings underscore the imperative of tackling the issue of air pollution in Kazakhstan, with particular emphasis on mitigating carbon emissions. Kazakhstan is positioned at the 14th rank on a global scale, and it holds the distinction of being the primary source of carbon dioxide emissions in the Central Asian region. The nation's gross domestic product (GDP) demonstrates a carbon intensity that is twice as high as the worldwide average and three times more than that of the European Union (EU). Carbon emissions are predominantly ascribed to extensive mining operations, exploration of oil and gas reserves, industrial endeavors, electricity production, economic growth, and the escalation of traffic levels. The leading pollutants over the years are depicted in Figure 6, with particular emphasis on sulfur dioxide as the primary environmental problem. Additional noteworthy pollutants consist of particulate matter and carbon oxides, particularly carbon dioxide. The mitigation of these challenges and the promotion

of sustainable development necessitate the implementation of air pollution control measures (Yourieva et al., 2020).

This section establishes a coherent linkage between Kazakhstan's energy profile, its economic reliance on fossil fuels, the potential of renewable energy sources, and the urgent necessity for green fiscal policies and air pollution control by organizing the discussion around these three pivotal issues. The implementation of a structured approach in this study serves to bolster the reliability of the findings and subsequent analysis, providing significant insights into the progress of Kazakhstan's transition towards a sustainable and environmentally conscious economy.

4. 3. REGRESSION ANALYSIS MODEL

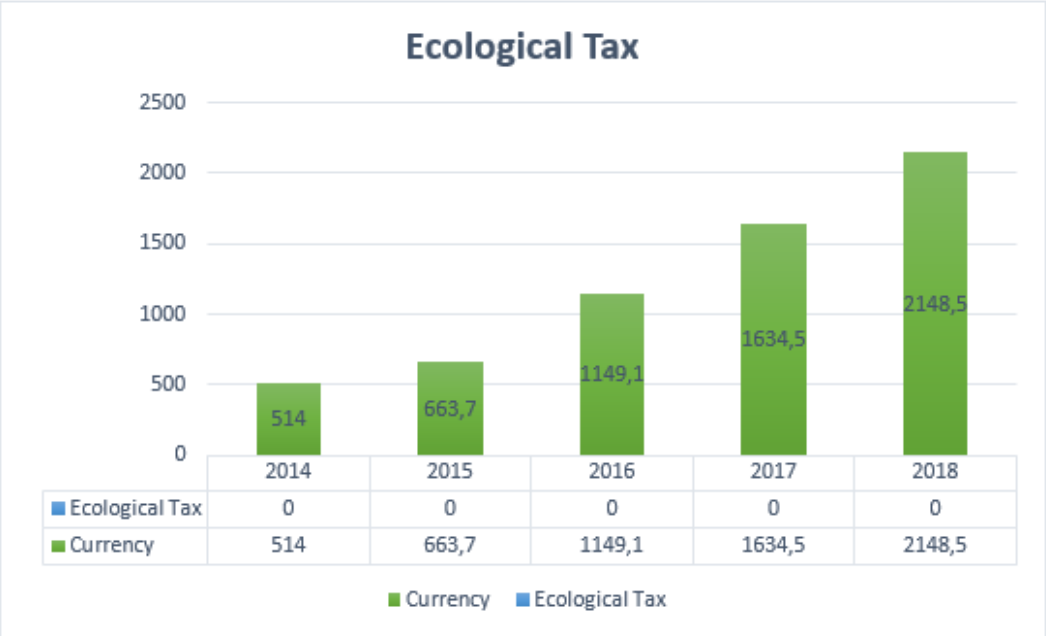
The data and sample used in this study are crucial components for doing rigorous academic research. The data refers to the information collected or seen during the research process while the sample is (Puška et al., 2020).

The objective of the regression analysis model is to examine the influence of Kazakhstan's green fiscal policies on the efficacy of renewable energy firms throughout five years, specifically from 2014 to 2018. This study examines the correlation between the quantity of enterprises in Kazakhstan, which is measured as an interval variable, and the degree of environmental progress. The dataset comprises measurements for the aforementioned variables within the designated period.

The evaluation of statistical parameters and model fit assessment.

In order to enhance the dependability and resilience of the regression analysis (Puška et al., 2018), statistical parameters and evaluations of model fit have been integrated. The topic of discussion is the multiple linear regression model.

Figure 7.The Ecological Tax



Source: IMF. (2022)

This study uses a multiple linear regression model to examine the relationship between environmentally innovative enterprises (y) and key predictors, such as renewable energy capacity (measured in megawatts), green fiscal policy expenditure (as a percentage of GDP), and ecological taxes. The model is formulated as follows:

The equation is represented as y equals beta zero plus beta one times x one plus beta two times x two plus beta three times x three plus epsilon. The effect of Kazakhstan's green fiscal policies on the enterprise effectiveness of renewable power enterprises is examined using a regression model.

$$y = mx + c \quad \text{(The linear regression model)} \tag{1}$$

Table 3. IMF Republic Kazakhstan April 2022

Energy Source	The potential of renewable Energy (MW)	Funding needs (% of GDP)	Green fiscal policy investment in billion-dollars	Ecological taxes (%)
Wind	384	27.5	1.5	2.4
Solar	884	27.5	1.5	2.4
Bioenergy	8	27.5	1.5	2.4
Small scale hydropower	225	27.5	1.5	2.4

Source: IMF. (2022)

In equation 1, *m0* is the potential for renewable energy, *x1* is the investment in green fiscal policy (an independent variable), and c is made up of ecological taxes (a measure of the barrier). *y* is the dependent variable. Results from each renewable energy source's model are obtained by applying the data from Table 3 to the model.

$$y1 = 225*1.5 + 0.024 = 337.524 \quad \text{(Hydropower energy)} \tag{2}$$

is the total investment for the small hydropower energy enterprise.

The total investment for the solar energy company is

$$y2 = 884 * 1.5 + 0.024 = 1326.024 \quad \text{(Solar Energy)} \tag{3}$$

The investment total for the wind energy business is

$$y3 = 384 * 1.5 + 0{,}024 = 576.024 \quad \text{(Wind energy)} \tag{4}$$

$$Y3 = 8*1.5 + 0.024 = 12.024 \quad \text{(Bioenergy)} \tag{5}$$

is the total investment for the bioenergy business.The above regression equations show the best of each renewable-energy source model that can best fit Kazakhstan in the period of green fiscal policy implementation. The equations show that the green fiscal policies will be beneficial to Kazakhstan in the long run.

5. CONCLUSION

The research findings provide insight into the interplay between Kazakhstan's economy, which heavily relies on fossil fuels, and the urgent necessity to shift towards renewable energy sources. The results above are based on an extensive examination of the current body of literature, highlighting the considerable importance of fossil fuel income, which constitutes nearly 50% of the federal budget of Kazakhstan. The extensive ramifications of this economic reliance have significant effects on governmental policy and the efficacy of firms working in the renewable energy industry.

Furthermore, the analysis of sustainable financial practices highlights the crucial interaction between financial management and environmental preservation in the contemporary global landscape. Organizations that use strategies focused on resolving social and ethical problems have been found to have enhanced financial performance while also making positive contributions to societal well-being and environmental conservation. The case study of Kazakhstan exemplifies a variety of effective strategies and governmental measures that are targeted toward promoting enduring sustainability. However, persisting challenges may hamper commercial growth.

Since renewable energy accounts for only 1% of energy production, the data shows a huge discrepancy. Kazakhstan has ample hydropower, solar, and wind energy, but the mismatch persists. The research and literature review emphasizes the need for a deliberate shift away from non-renewable energy sources to improve renewable energy policies. Due to its nuclear resources, Kazakhstan can study cutting-edge technologies like nuclear fusion to maximize its potential. The transition holds significant importance for Kazakhstan and other countries seeking to diminish their economic dependence on multinational oil companies and achieve the potential benefits of a sustainable economy.

Although Kazakhstan has achieved considerable progress in the implementation of many policies aimed at promoting a Green Economy, there are still practical obstacles pertaining to legal frameworks, infrastructure, funding, support mechanisms, data availability, and information distribution that need to be addressed. The report posits that Kazakhstan's endeavors towards establishing a green economy and promoting sustainable development might be enhanced through the cultivation of mutually advantageous trade agreements, the implementation of water treaties, and the nurturing of regional collaboration.

Moreover, the banking sector in Kazakhstan is currently facing the challenge of increasing loan volumes, which in turn is contributing to the escalation of economic hazards. The efficacy of bank loans in providing financial support for eco-friendly initiatives is constrained. Hence, it is imperative to secure more financial resources to bolster policies driven by incentives, particularly in light of the significant rise in ecological taxes. Moreover, the need for more momentum in the stock market is a formidable obstacle to pioneering renewable energy initiatives. Kazakhstan is currently endeavoring to establish a framework for promoting the expansion of renewable energy. However, the country has encountered obstacles in the form of historical management practices within the ecological, social, and environmental spheres, which have impeded progress. These challenges include the exploitation of natural resources, fluctuations in global raw material prices, and the need for comprehensive sustainable planning.

6. RECOMMENDATIONS

Economic stagnation may be experienced in Kazakhstan's major trading partners, including China, Europe, Japan, America, and Russia. To manage such an external danger, Kazakhstan

has to grab this chance to develop a strong, independent, adaptable, and creative economy. For higher living standards for its people and total economic development to place Kazakhstan in the top thirty completely developed nations, the country must improve its governance, reduce corruption, and at the same time engage in more active political engagement.

According to independent research, for Kazakhstan to realize the goal of joining the developed nations by 2050, seven issues must be resolved: the urban and regional economies, green economy, global and regional integration, energy resources, human resources, institutions, and knowledge economy.

To address the challenges identified and capitalize on opportunities, Kazakhstan must consider the following recommendations, which emerge from the research and analysis:

- Diversification of the Economy: Kazakhstan should actively diversify its economy to reduce dependence on major trading partners like China, Europe, Japan, America, and Russia. This diversification should focus on fostering a strong, independent, adaptable, and creative economy to weather external economic risks effectively.
- Good Governance and Anti-Corruption Efforts: To achieve higher living standards and comprehensive economic development, Kazakhstan must prioritize good governance, reduce corruption, and engage in more active political engagement.
- Seven Key Sectors for Development: Independent research suggests that Kazakhstan should focus on seven critical sectors to achieve its goal of joining developed nations by 2050. These sectors include:
- Skilled Labor Force: Training the unskilled labor force to acquire specialized skills and promoting entrepreneurship with minimal state intervention.
- Renewable Energy Technology: Promoting local participation and knowledge transfer in renewable energy technology.
- Green Economy: Supporting analysis, incentivizing local and foreign investors, and funding renewable and environmentally friendly energy initiatives.
- Global Energy Transition: Emulating successful models like the Energy Information Administration (EIA) to effectively transition to renewable energy sources.
- Adaptive Planning: Implementing adaptive planning strategies, like the Delphi simulation approach, to address global crises and emerging challenges.
- Human Resource Forecasting: Utilizing human resources for forecasting financial hardships and risks, particularly in the tourism industry, to ensure the viability of banking organizations.

These recommendations are rooted in the research and analysis conducted throughout the article and are intended to guide Kazakhstan towards a sustainable and prosperous future.

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