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TABLE OF CONTENTS

List of Participants.....	1
ABSTRACTS	2
Festus Victor Bekun Modelling the Nexus between Economic Globalization and Ecological Footprint in Developing Economies.....	3
Mohamed Jaouad Malzi, Saïd Hanchane, Aziz Ettahir Household Natural Gas Demand: Empirical Evidence of Non-linearity.....	4
Stephen Taiwo Onifade Tourism Growth and Globalization: Deciphering the Environmental and Sustainability Facets of the Aviation Sector in the Middle East.....	5
Beata Reformat, Katarzyna Bilińska, Małgorzata Kiezel The Impact of Explorer Brand on Developing Sustainable Business Models: Work Life Balance Perspective.....	6
Marcello Ruberti An Overview on the World’s Patents about the Sea Energy Conversion Systems.....	7
Maria Vetrova, Igor Arenkov, Dinara Ivanova Low Carbon Economic Development and the Fourth Energy Transition: Challenges and Opportunities.....	8
FULL PAPERS.....	9
Matteo Abbruzzese, Davide Infante, Janna Smirnova Increasing the Use of Electrical Non-combustible and Combustible Renewables: The Effects on Air Pollution in Europe	10
Inga Cotoros, Nicolai Russu Study on the Impact of Post-pandemic Effects on the Quality of Accounting Information.....	22
Marina Danilina Economic Development of Russia: Problems and Perspectives.....	32
Marina Danilina Labor Market and Economic Trends in 2023.....	38
Mohamed Habib Frank, Murat Donduran Patterns and Trends of Informality in Türkiye	44
Mehmet Nuri İnel An Empirical Check-Up Approach Using Data Analytics for Sustainability in Micro, Small and Medium-Sized Enterprises.....	52
Vasilisa Makarova, Kasiet Kambaralieva Abnormal Stock Returns as a Leading Indicator of Crisis.....	63
Raad Olewi The Impact of Cash Holding on the Firm's Investment and Production.....	72

Gamze Sart	
Statistical Analysis of University Students' Green Purchasing Attitudes.....	79
Gamze Sart	
The Relationship between Corporate Social Responsibility and Corporate Reputation in Academics.....	89
Oksana Seroka-Stolka	
Decarbonization of Transport and Energy Sector in the Perspective of a Climate Neutral Economy by 2050: The case of Poland.....	99
Funda H. Sezgin	
The Relationship between Sustainability and Gender Inequality: Evidence from the BRICS Countries.....	111
Funda H. Sezgin	
The Relationship between Renewable Energy and Carbon Footprint: Evidence from Türkiye.....	119
Mohammad A. Ta'Amnha, Ghazi A. Samawi, Omar M. Bwaliez	
Investing in Employee Well-being: The Key to Retention in the Hospitality Industry During the Post-COVID-19 Era	128
Gökçe Tekin Turhan	
The Relationship between Sustainability and Stock Market Performance in BIST Companies.....	146
Pınar Tokal	
Effectiveness of Dynamic Factor Analysis Approach in Financial Data.....	155

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Chapter II – ABSTRACTS

Modelling the Nexus between Economic Globalization and Ecological Footprint in Developing Economies

Festus Victor Bekun¹

Abstract

Sequel to the Paris agreement (COP21) which has raised concerns for policymakers and stakeholders on the need for cleaner energy sources and mitigating climate change action. However, there is need for investigation into emerging blocs on the track towards environmental sustainability. To this end, this present study leverages on annual frequency data for econometrics analysis. Empirical results highlight that increase economic activities (GDP) increase ecological footprint i.e., dampens environmental quality in E7 economies. The same detrimental effect is seen for agriculture and economic globalization. Interestingly clean energy indicates statistical traits to enhance environmental superiority in the bloc examined. These outcomes have macro-economic and environmental implications for promoting cleaner energy targets which is in line with UN Sustainable Development Goals (UNSDGs-7 and 13). From a policy perspective the investigated economies are meant to strengthen her environmental commitment and gradually make the transition to cleaner energy sources. More policy suggestions are highlighted in the concluding section.

Keywords: climate change mitigation; carbon-reduction; COP21 agreement; panel econometrics; E7 economies

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Household Natural Gas Demand: Empirical Evidence of Non-linearity

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Abstract

This study attempted to check the existence of nonlinear relationship between gas demand and its main determinants. To this end, the study applies nonparametric and semi-parametric panel data model on a large panel of OECD countries over the period 1980-2015. The analysis demonstrates the existence of a non-linear relationship between gas demand and its main determinants. The inverted-U hypothesis is totally confirmed in the case of density and urbanization. This study also finds that the impact of the environmental policy stringency on natural gas use is very strong in the long term. Finally, a positive relationship exists between elderly population and the use of gas as the curve is revealing a positive trend. Based on the empirical evidence this analysis emphasizes on the proper implementation of the undertaken environmental and demographic policies towards the sustainable development agendas.

Keywords: residential natural gas use; OECD countries; environmental policy; nonparametric model; nonlinear estimation; Inverted-U

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Tourism Growth and Globalization: Deciphering the Environmental and Sustainability Facets of the Aviation Sector in the Middle East

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Abstract

The aviation industry in the Middle East as not only brought about economic blessings to the region from its close to three and a half million employments creation and more than US\$200 billion additional value to GDP of the area, but it also induces other sectoral growths. Notable among the beneficial sectors from this industry is the region’s prosperous tourism sector which however is attracting some concerns on environmental grounds. Given the era of increasing globalization, this study looks at the environmental aspect of the aviation industry within the framework of the economic expansion witnessed over the years and the levels of energy utilization of the region. 2nd generation analytical tools were used to examine data on international tourists who arrive in the region since 1975 until 2018 in the pre-pandemic time as retrieved from the UN’s World Tourism Organization (UNWTO, 2020). The analysis’s scope encompasses the top 5 most-visited countries in the region including the United Arab Emirate (UAE), Egypt, Saudi Arabia, Qatar, and Oman. The empirical outcome divulges that both globalization and aviation industry exert a significant environmental damage in the region via carbon emission with the latter having a long-run elasticity impact calculated to be ~ 1.03 . Furthermore, both the regional income growth and energy utilization worsens environmental quality, although the former showing the overall least carbon-inducing elasticity. Hence, although the aviation industry aids regional economic diversification from resource-based economy to other prospective industries like tourism, the study essentially posits the need for authorities to put measures in place to address the negative environmental facets of the aviation sector.

Keywords: tourism growth, Middle East, air transport, environment, energy use, globalization

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The Impact of Explorer Brand on Developing Sustainable Business Models: Work Life Balance Perspective

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Abstract

In recent years, the Work-Life Balance (WLB) concept, which allows employees to achieve harmony between their private and professional lives, has been growing in importance in the labor market. This situation is particularly important for young people (Generation Z), who are just beginning their careers and are willing to sacrifice their private lives for the benefit of the company. It is of great importance for them to be able to develop their interests and realize themselves in roles other than their professional one. They are ready at any time to change their place of employment to one that is more comfortable with their private lives. The choice of employer brand is therefore extremely important to them. Attractive to them are those companies that will give them the opportunity to reconcile work with non-work duties or activities, and therefore take care of their work-life balance and develop sustainable business models. The purpose of this article is to analyze the impact of employer branding on the development of sustainable business models in relation to the Work-Life Balance concept, to show its beneficial impact on the company and employees, and to present best practices.

Keywords: explorer brand, Work-Life Balance, sustainable business models

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An Overview on the World’s Patents about the Sea Energy Conversion Systems

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Abstract

The sea is a huge and inexhaustible reservoir of energy, with an estimated potential of at least 10 TW of electricity. Although, to date in the world, it remains almost entirely untapped. Since the ultimate source of the sea’s energy is the sun, it qualifies as a renewable source, has no operational or fuel costs, and is relatively non-polluting if compared to conventional sources of energy. Unfortunately, technologies to capture energy from the oceans on a large scale are still in the early stages of their development and have very high capital expenditures (CAPEX). In principle, and considering the number of patents, at least five types of ocean energy can be converted: sea currents, waves, tides, salt content, and thalassic-thermal energy. The main aim of this paper is to analyse the present situation about the different categories of patented technologies and future potentials by a survey of world trends in research and installations.

Keywords: sustainability, energy, environment, technologies

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Low Carbon Economic Development and the Fourth Energy Transition: Challenges and Opportunities

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Abstract

Decarbonization issues in the field of technological solutions, business strategies, sustainable economic development are being studied by scientists worldwide (Pakhomova N.V., 2021-2022, Richter K.K. 2021-2022, Makarova A.S. 2022, Xiao M. 2021, Creutzig F. 2017, Way R. 2022, Hilaire J. 2019, etc.); leading companies around the world are investing in new low-carbon technologies, and governments are developing low-carbon socio-economic development strategies. However, the UN Emissions Gap Report 2022 states that countries are making insufficient efforts to transition to a low-carbon economy, for example, keeping global warming within 1.5°C requires a reduction in global greenhouse gas emissions by 45% by 2030. The energy sector traditionally remains the key source of greenhouse gas emissions, accounting for about 73% of emissions worldwide. Therefore, the focus of the climate agenda is the decarbonization of production and technological processes and a new energy transition, which involves the gradual abandonment of traditional energy sources in favor of renewable and low-carbon alternatives. At the same time, the transition to alternative energy sources in the short and medium term contains a number of risks associated with low technological readiness of production and infrastructure solutions, possible disruptions in energy supply, and a decrease in incomes in countries exporting fuel and energy resources. The problem of the fourth energy transition is analyzed in the study considering the worsening geopolitical situation and the energy crisis of 2022. Therefore, this study is aimed, firstly, at systematizing the technologies of decarbonization of the energy sector, and secondly, at analyzing the possibilities and limitations of the fourth energy transition in the countries exporting fuel and energy resources. The object of special attention is CCUS technologies and the potential for their implementation in producing countries. The solution of the tasks set is based on tools and methods within the framework of the theory of sustainable development and the modern concept of energy transition, institutional, sectoral and cross-country analysis.

Keywords: climate agenda, fourth energy transition, decarbonization technologies, energy sector, greenhouse gas emissions, CCUS technologies.

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Chapter II – FULL PAPERS

Increasing the Use of Electrical Non-combustible and Combustible Renewables: The Effects on Air Pollution in Europe

Matteo Abbruzzese¹ Davide Infante² Janna Smirnova³

Abstract

The paper aims to investigate the impact of the introduction of electrical non-combustible and combustible renewables on the reduction of emissions, expressed at disaggregated level. The effect of electrical renewables is estimated by means of fixed and random effects of a panel data of twenty-eight European Union countries analysed for the period 1995-2015. The results confirm that electrical renewables play a strategic role in abating pollutant emissions in European countries. For each environmental indicator, the share of electricity generated from renewable sources shows a negative elasticity with non-combustible renewables have higher elasticities than those associated with combustible renewables. The results demonstrate that the expansion of electrical non-combustible renewables can be considered as an effective policy tool for contrasting air pollution.

Keywords: air pollution, non-combustible renewables, combustible renewables, non-renewables, energy transition

1. Introduction

With the incremental improvements in green technologies and the exponential growth of renewable energy power, the ability of renewable energy sources to reduce air pollutants has become one of the most important research issues. In this context, RES-E (electricity generated from green energy sources) is demonstrated to play an important role in combating environmental pollution (Dogan and Seker, 2016; Dogan and Inglesi-Lotz, 2017).

The existing literature studying the environmental effect of renewable energy sources mostly uses aggregate energy indicators (Ang, 2008; Atici, 2009), while the analysis of the environmental effect associated with the disaggregation between combustible and non-combustible renewables represents a question scarcely addressed. The aim of this paper is to fill this gap and provide the analysis of the impact of the adoption of different green energy electrical technologies on the quality of the environment in European countries. The innovative element consists of quantitative assessment of the environmental impact of the two main macro-categories of renewables differentiated into non-combustible renewables (hydroelectric, wind, solar and geothermal) and combustible renewables (biomass). Therefore, the purpose is to identify which sub-category of electrical renewables causes the greatest environmental improvement in terms of lower emissions of various polluters.

Besides greenhouse gas emissions, environmental quality is influenced by numerous polluters. For example, nitrogen dioxide and particulate matter pose serious health risks, while sensitive ecosystem areas are affected by acid deposition of excess sulphur compounds. For this reason, the present work takes into consideration additional to greenhouse gases (GHG) emissions other indicators, such as nitrogen oxides (NO_x), sulphur oxides (SO_x) and suspended particulate matter (PM 2.5) and analyse them at disaggregated level.

The analysis provided concentrates on 28 European countries for the period 1995-2015. We estimate different models, based on panel data with fixed and random effects and, starting from

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comparing the application of fossil and renewable energy sources on environment, quantifying the effect of the diffusion of combustible and non-combustible electrical renewables. We demonstrate that the increasing use of non-combustible renewables such as wind, solar, geothermal, and hydro energy represent a most effective tool for pollution abatement.

2. Literature Review

An important strand of environment-energy-growth literature (Dogan and Seker, 2016) concentrates on disaggregated environmental effect of renewable energy sources. While a certain uniformity has been recorded for aggregate energy consumption, according to which an increase in energy intensity corresponds to an increase in pollution, when the various energy sources are analysed separately, contrasting the results: some studies obtain the surprising result that consumption from RES (renewable energy sources) contributes to an increase in pollutant emissions (Boluk and Mert, 2014; Farhani and Shabaz, 2014). Instead, some authors, such as Shafiei and Salim (2014) and Adewuyi and Awodumi (2017) find that an increase in energy intensity from renewable resources leads to a reduction in pollutant emissions.

The strand of literature analysed has a few critical points. Firstly, with the exception of a few authors (Roca et al., 2001; Dogan and Seker, 2016), there is little consideration for electrical renewables: the majority of authors tend to model pollutant emissions according to gross final energy consumption (Santana de Souza et al., 2018) or gross domestic consumption per inhabitant (Sinha et al., 2017). Another feature, common to various scholars, concerns the environmental indicators analysed, with the exception of Roca et al. (2001), the authors propose to assess the disaggregated effect of energy technologies in relation to greenhouse gas emissions and, in particular, carbon dioxide emissions. Clearly, it would be interesting to assess this effect in relation to a greater variety of pollutants.

The methodological strategies adopted in the literature are characterised by considerable heterogeneity. Alongside models that include elements of dynamics (Marrero, 2010; Bengochea and Faet, 2012; Sinha et al., 2017), there is the presence of linear (Thombs, 2018) and/or non-linear (Dogan and Seker, 2016) models in which an indicator of environmental pollution is modelled as a function of a multiplicity of variables. Non-linearity is closely related to the theoretical framework of reference as multiple authors make use of Extended Kuznets Curve models to study the disaggregated environmental effect of individual energy technologies.

A certain degree of heterogeneity is also found in the empirical methodology. This dissimilarity is closely related to the type of data used (time series, cross-section and/or panel) and the research question addressed. In the case of dynamic models, authors are oriented towards obtaining the long-run relationships between the time series analysed (Dogan and Seker, 2016) by assuming that the errors follow autoregressive processes or by adding among the regressors the dependent variable lagged by one or more periods (Bengochea and Faet, 2012). In contrast, other authors make use of static models (Armeanu et al., 2017) in which all those factors that vary over time and/or between units but cannot be included in the regression model because they are unobservable are controlled for.

On the basis of analysis provided, the novelty of this work stays, first of all, in considering the disaggregated environmental effect of energy sources, which is rarely done in the literature. As we argue, there are differences in the impact on environment between the two categories of renewables, combustible and non-combustible, and it would be crucial to identify and quantify these effects. In fact, the literature suggests that the environmental effect of electrical renewables varies depending on the energy resource used in generation and/or consumption processes (Thombs, 2018). There is an environmental productivity differential between non-combustible (hydro, solar, geothermal, wind) and combustible (biomass) renewables.

Therefore, we consider the effect of electrical renewables by postulating an environmental productivity differential between combustible and non-combustible renewable sources.

Another innovative feature concerns the environmental indicators analysed. Electricity production processes are highly correlated not only with greenhouse gas emissions, but in general with air pollution. The literature examined, with the exception of Roca et al. (2001), focuses exclusively on greenhouse gas emissions, thus neglecting other pollutants that are known to be harmful to human health and the ecosystem. For this reason, in the present work, we assess both greenhouse gas emissions and the most widespread air pollutants, such as suspended particulates, sulphur dioxide and nitrogen oxides.

3. Data and Methodology

To study the relationship between the deployment of RES-E and air pollution in European countries we apply fixed and random effects of a panel data estimation of twenty-eight European Union countries analysed for the period 1995-2015. First, according to Dogan and Seker (2016), we consider two macro categories of electricity technologies: fossil fuels (or traditional technologies) and renewable electricity. The objective is to compare two types of technology and verify whether the spread of RES-E has different effects on pollutant emissions. Secondly, we assess the disaggregated environmental effectiveness of electric renewables. Here, the distinction is between combustible renewables (Dogan and Inglesi-Lotz, 2017) and non-combustible renewables (Solarin et al., 2017). This strategy allows us to empirically test whether the two categories of electrical renewables had a different effect on the pollutants examined: greenhouse gases (GHG), suspended particulates (PM 2.5), sulphur oxides (SO_x) and nitrogen oxides (NO_x). In order to avoid endogeneity problems in the selection of the main variables of interest and the dependent variables (GHG, NO_x, SO_x, Pm 2.5) are measured with reference to the electrical compartment. This strategy allows to reduce the probability of running into problems of bias from omitted variables since these emissions are analysed with reference to the main variables that could influence their generation process. In particular, the analyses carried out consider all probable anthropogenic sources of these emissions which, with reference to the electricity sector, are mainly determined by production and consumption activities.

Table 1 contains a summary description of the variables and information sources, while descriptive statistics are shown in the Table 2.

Table 1: Definition of variables and source of data

Variables	Definition	Source
GHG	Greenhouse gases in tonnes per inhabitant and from the public electricity and heat production sector	Eurostat
NO _x	Sulphur oxides in tonnes per inhabitant and from the Energy production and distribution sector	Eurostat
SO _x	Sulphur oxides in tonnes per inhabitant and from the energy production and distribution sector	Eurostat
PM 2.5	Suspended particulates in tonnes per inhabitant and from the Energy production and distribution sector	Eurostat
FOSSIL	Share of electricity generated by gas, oil and coal	European Commission, national energy balances
RES_E	Share of electricity generated from renewable sources	European Commission, national energy balances
NoComb	Share of electricity generated from non-combustible renewable sources	European Commission, national energy balances
Comb	Share of electricity generated from combustible renewable sources	European Commission, national energy balances

Table 2: Descriptive statistics

Variables	Obs.	Media	Std. Dev.	Min	Max
GHG	588	2.893693	1.967277	0.200073	11.26442
ln(GHG)	588	0.837589	0.69846	-1.60907	2.421649
NO _x	588	0.005298	0.003449	0.000165	0.024121
ln(NO _x)	588	-5.4881	0.7624	-8.7083	-3.72468
SO _x	588	0.015816	0.02058	7.29E-06	0.135078
ln(SO _x)	588	-5.10755	1.762665	-11.8292	-2.0019
PM2.5	448	0.000303	0.000712	0	0.009011
ln(PM2.5)	448	-8.552	1.135718	-12.2991	-4.70927
NoComb	588	0.199583	0.200782	0	0.814672
ln(NoComb)	563	-2.26701	1.521082	-8.44505	-0.20497
Comb	588	0.024894	0.03324	0	0.172688
ln(Comb)	512	-4.43916	1.626702	-10.8124	-1.75627
RES_E	588	0.224508	0.208753	0	0.827799
ln(RES_E)	563	-2.01282	1.324786	-8.44505	-0.18898
Fossil	588	0.576758	0.277383	0.011786	1
ln(Fossil)	588	-0.74884	0.775171	-4.44088	0

4. Models and Results

4.1. Baseline Model

As a first step, following Dogan and Seker (2016), the environmental effectiveness of the two main macro categories of electricity technologies, represented by renewables and fossil fuels, is assessed through the following functional specification:

$$\ln(E)_{it} = \alpha_i + \gamma_t + \beta_1 \ln(\text{RES_E})_{it} + \beta_2 \ln(\text{Fossil})_{it} + \varepsilon_{it}$$

where $\ln(E)$ is natural logarithm of the environmental indicator in per capita terms that is represented from time to time by GHG, NO_x, SO_x, PM 2.5; $\ln(\text{RES_E})$ is natural logarithm of the share of electric energy generated by all electric renewables (wind, geothermal, solar, hydroelectric, biomass) in relation to total production; $\ln(\text{Fossil})$ is natural logarithm of the share of electricity generated from fossil sources (oil, natural gas and coal) in relation to total production; ε is the error term of the regression, α is individual fixed effects and γ is time fixed effects. The results of the estimates are shown in the tables below (Tables 3-6).

Table 3: Results of Model 1 for the Kyoto basket (GHG)

Dependent variable: ln(GHG)	Fixed Effects		Random Effects	
	(1)	(2)	(3)	(4)
Const	1.066*** (0.042)	0.962*** (0.061)	1.048*** (0.093)	0.972*** (0.105)
ln(RES_E)	-0.108*** (0.008)	-0.102*** (0.012)	-0.110*** (0.012)	-0.105*** (0.015)
ln(Fossil)	0.605*** (0.037)	0.562*** (0.039)	0.595*** (0.035)	0.557*** (0.037)
Time dummies	-	Yes	-	Yes
Obs	563	563	563	563
Countries	28	28	28	28
R ²				
within	0.439	0.468	0.439	0.467
between	0.555	0.5568	0.557	0.558

overall	0.527	0.5323	0.529	0.534
Prob>F	0.0000 (208.55)	0.0000 (20.50)	-	-
Prob > chi2	-	-	0.0000 (450.41)	0.000 (484.39)
Temporal effects= 0	-	F(20, 513) = 4.22 Pr= 0.002	-	chi2(20) = 28.08 Pr= 0.1074
Individual effects = 0	F(27, 533)=99.72 Pr= 0.0000	F(27, 513)=100.94 Pr= 0.0000	-	-

Note: Standard errors in brackets; *** significance at 1%; ** significance at 5%; * significance at 10%

Table 4: Results of Model 1 for nitrogen oxides (NO_x)

Dependent variable: ln(NO _x)	Fixed Effects		Random Effects	
	(1)	(2)	(3)	(4)
Const	-5.378*** (0.066)	-4.982*** (0.091)	-5.433*** (0.116)	-5.003*** (0.134)
ln(RES_E)	-0.216*** (0.015)	-0.095*** (0.020)	-0.212*** (0.019)	-0.097*** (0.021)
ln(Fossil)	0.743*** (0.058)	0.650*** (0.058)	0.684*** (0.054)	0.623*** (0.053)
Time dummies	-	Yes	-	Yes
Obs,	563	563	563	563
Countries	28	28	28	28
R ²				
within	0.405	0.498	0.405	0.498
between	0.445	0.437	0.446	0.419
overall	0.399	0.415	0.401	0.418
Prob>F	0.0000 (182.01)	0.0000 (20.50)	-	-
Prob > chi2	-	-	0.0000 (373.35)	0.000 (526.74)
Temporal effects =0	-	F(20, 513) = 4.71 Pr= 0.0000	-	chi2(20) = 99.10 Pr= 0.0000
Individual effects = 0	F(27, 533) =55.72 Pr= 0.0000	F(27, 513) = 62.71 Pr= 0.0000	-	-

Note: Standard errors in brackets; *** significance at 1%; ** significance at 5%; * significance at 10%

Table 5: Results of Model 1 for sulphur oxides (SO_x)

Dependent variable: ln(SO _x)	Fixed Effects		Random Effects	
	(1)	(2)	(3)	(4)
Const	-5.807*** (0.140)	-5.991*** (0.149)	-5.879*** (0.295)	-4.244*** (0.309)
ln(RES_E)	-0.594*** (0.040)	-0.163*** (0.036)	-0.592*** (0.040)	-0.174*** (0.036)
ln(Fossil)	0.739*** (0.123)	0.482*** (0.095)	0.696*** (0.117)	0.496*** (0.092)
Time dummies	-	Yes	-	Yes
Obs.	563	563	563	563
Countries	28	28	28	28
R ²				
within	0.362	0.675	0.362	0.675
between	0.270	0.222	0.272	0.227
overall	0.279	0.291	0.280	0.295
Prob>F	0.0000 (151.12)	0.0000 (48.36)	-	-
Prob > chi2	-	-	0.0000 (310.78)	0.000 (1071.43)
Temporal effects=0	-	F(20, 513) = 24.67	-	chi2(20) = 492.47

		Pr= 0.0000		Pr= 0.0000
Individual effects = 0	F(27, 533)=89.48 Pr= 0.0000	F(27, 513) =171.41 Pr= 0.0000		

Note: Standard errors in brackets; *** significance at 1%; ** significance at 5%; * significance at 10%

Table 6: Results of Model 1 for suspended particulate matter (PM2.5)

Dependent variable: ln(PM2.5)	Fixed Effects		Random Effects	
	(1)	(2)	(3)	(4)
Const	-8.808*** (0.112)	-8.880*** (0.145)	-8.875*** (0.218)	-8.366*** (0.243)
ln(RES_E)	-0.317*** (0.032)	-0.164*** (0.040)	-0.316*** (0.032)	-0.166*** (0.038)
ln(Fossil)	0.506*** (0.053)	0.333*** (0.081)	0.436*** (0.056)	0.301*** (0.081)
Time dummies	-	Yes	-	Yes
Obs.	433	433	433	433
Countries	28	28	28	28
R ²				
within	0.262	0.350	0.261	0.349
between	0.082	0.071	0.086	0.075
overall	0.091	0.111	0.096	0.115
Prob>F	0.0000 (71.43)	0.0000 (12.26)	-	-
Prob > chi2	-	-	0.0000 (141.79)	0.000 (211.54)
Temporal effects =0	-	F(15, 388) = 3.49 Pr=0.0000	-	chi2(15) = 54.96 Pr=0.0000
Individual effects = 0	F(27, 403)=79.30 Pr=0.0000	F(27, 388)=86.29 Pr=0.0000	-	-

Note: Standard errors in brackets; *** significance at 1%; ** significance at 5%; * significance at 10%

Our preliminary results confirm the environmental benefits of electric renewables. For the Kyoto basket (GHG), the estimation results suggest that a 1% increase in the share of electricity generated from renewable sources is associated with a reduction in GHG emissions ranging from 0.108% (fixed effects) to 0.11% (random effects). The effect remains roughly similar when time effects are controlled.

The estimations for suspended particulates (PM 2.5), nitrogen oxides (NOx) and sulphur oxides (SOx) confirm that the increase in the share of electricity generated from renewable energy sources has a negative and statistically significant coefficient. The environmental elasticity of electrical renewables, considering the validity of the time fixed effects and the results of the Hausman test⁴, varies depending on the substances analysed. Considering random effects, for sulphur oxides (SOx) a 1% increase in the share of electricity generated from renewables corresponds to a 0.174% reduction in emissions, for nitrogen oxides (NOx) it corresponds to a 0.097% and for suspended particulates (PM2.5) to a 0.166%.

Accordingly with the existing literature, electricity generation from fossil sources has a positive effect on all pollutants examined. Comparing the four environmental indicators, a 1% increase in the ratio of fossil combustion technologies to total electricity production generates an increase in emissions of 0.592% (GHG), 0.650% (NOx), 0.301% (PM 2.5) and 0.496% (SOx).

4.2. The Role of Electrical Combustible and Non-combustible Renewables

In order to empirically verify the disaggregated environmental potential of renewable electricity technologies, Model 2 takes into account electrical combustible renewables (biomass) and non-

⁴ Available upon request.

combustible renewables (solar, wind, geothermal and hydro) and takes the following functional form:

$$\ln(E)_{it} = \alpha_i + \gamma_t + \beta_1 \ln(\text{RES_E})_{hit} + \beta_2 \ln(\text{Fossil})_{it} + \varepsilon_{it}$$

where, among the new variables, $\ln(\text{Nocomb})$ is natural logarithm of the share of electricity generated by non-combustible renewables (wind, geothermal, solar, hydro) in relation to total production and $\ln(\text{Comb})$ is natural logarithm of the share of electricity generated by combustible renewables (biomass) in relation to total production.

In according with Hausman test⁵, and in line with the baseline model, the fixed effects estimator is the most efficient for models with dependent variable nitrogen oxides (NO_x) and greenhouse gases (GHG). For the other specifications, the most efficient estimator is the random effects estimator. The results of the estimations are represented in Tables 7-10.

Table 7: Results of Model 2 for the Kyoto basket (GHG)

Dependent variable: ln(GHG)	Fixed Effects		Random Effects	
	(1)	(2)	(3)	(4)
Cons.	1.119*** (0.050)	0.738*** (0.079)	1.092*** (0.099)	0.726*** (0.114)
ln(NoComb)	-0.082*** (0.005)	-0.083*** (0.006)	-0.087*** (0.006)	-0.088*** (0.008)
ln(Comb)	-0.016*** (0.004)	-0.055*** (0.006)	-0.014*** (0.005)	-0.047*** (0.009)
ln(Fossil)	0.728*** (0.037)	0.735*** (0.038)	0.709*** (0.036)	0.707*** (0.036)
Time dummies	No	Yes	No	Yes
Obs.	512	512	512	512
Countries	28	28	28	28
R ²				
within	0.541	0.601	0.541	0.605
between	0.515	0.489	0.520	0.497
overall	0.501	0.488	0.512	0.497
Prob>F	0.0000 (189.14)	0.0000 (30.79)	-	-
Prob > chi2	-	-	0.0000 (592.10)	0.0000 (721.29)
Temporal effects =0	-	F(20, 461) = 3.77 Pr= 0.0000	-	chi2(20) = 70.60 Pr= 0.0000
Individual effects= 0	F(27, 481) = 109.77 Pr= 0.0000	F(27, 461) = 122.91 Pr= 0.0000	-	-

Note: standard errors in brackets; *** significance at 1%; ** significance at 5%; * significance at 10%

Table 8: Model 2 results for nitrogen oxides (NO_x)

Dependent variable: ln(NO _x)	Fixed Effects		Random Effects	
	(1)	(2)	(3)	(4)
Cons.	-5.622*** (0.080)	-5.181*** (0.132)	-5.679*** (0.128)	-5.185*** (0.169)
ln(NoComb)	-0.124*** (0.014)	-0.100*** (0.014)	-0.124*** (0.013)	-0.100*** (0.013)
ln(Comb)	-0.094*** (0.008)	-0.068*** (0.009)	-0.093*** (0.008)	-0.065*** (0.010)
ln(Fossil)	0.803*** (0.060)	0.700*** (0.063)	0.742*** (0.056)	0.661*** (0.058)
Time dummies	No	Yes	No	Yes
Obs.	512	512	512	512

⁵ Available upon request.

Countries	28	28	28	28
R ²				
within	0.477	0.520	0.477	0.526
between	0.414	0.404	0.415	0.404
overall	0.384	0.403	0.386	0.406
Prob>F	0.0000 (146.51)	0.0000 (21.74)	-	-
Prob > chi2	-	-	0.0000 (445.14)	0.0000 (514.92)
Temporal effects=0	-	F(20, 461) = 2.06 Pr= 0.0048	-	chi2(20) = 45.56 Pr= 0.0009
Individual effects = 0	F(27, 461) = 62.94 Pr= 0.0000	F(27, 481) = 64.38 Pr= 0.0000	-	-

Note: Standard errors in brackets; *** significance at 1%; ** significance at 5%; * significance at 10%

Table 9: Model 2 results for sulphur oxides (SO_x)

Dependent variable: ln(SO _x)	Fixed Effects		Random Effects	
	(1)	(2)	(3)	(4)
Cons.	-6.503*** (0.146)	-4.525*** (0.209)	-6.547*** (0.279)	-4.472*** (0.352)
ln(NoComb)	-0.154*** (0.014)	-0.082** (0.018)	-0.163*** (0.013)	-0.089*** (0.016)
ln(Comb)	-0.362*** (0.016)	-0.076** (0.020)	-0.361*** (0.016)	-0.083*** (0.020)
ln(Fossil)	0.993*** (0.109)	0.720*** (0.100)	0.977*** (0.104)	0.725*** (0.097)
Time dummies	No	Si	No	Si
Obs.	512	512	512	512
Countries	28	28	28	28
R ²				
within	0.540	0.683	0.539	0.683
between	0.311	0.169	0.318	0.189
overall	0.328	0.275	0.334	0.281
Prob>F	0.0000 (188.19)	0.0000 (43.27)	-	-
Prob > chi2	-	-	0.0000 (574.92)	0.0000 (1003.96)
Temporal effects = 0	-	F(20, 461) = 10.45 Pr= 0.0000	-	chi2(20) = 206.50 Pr= 0.0000
Individual effects = 0	F(27, 481) = 105.07 Pr= 0.0000	F(27, 461) = 153.03 Pr= 0.0000	-	-

Note: Standard errors in brackets; *** significance at 1%; ** significance at 5%; * significance at 10%

Table 10: Model 2 results for suspended particulate matter (PM 2.5)

Dependent variable: ln(PM2.5)	Fixed Effects		Random Effects	
	(1)	(2)	(3)	(4)
Cons.	-9.246*** (0.134)	-8.427*** (0.207)	-9.323*** (0.231)	-8.456*** (0.287)
ln(NoComb)	-0.228*** (0.023)	-0.193*** (0.024)	-0.225*** (0.021)	-0.190*** (0.023)
ln(Comb)	-0.128*** (0.026)	-0.118*** (0.034)	-0.130*** (0.025)	-0.120*** (0.033)
ln(Fossil)	0.499*** (0.052)	0.321*** (0.068)	0.433*** (0.055)	0.289*** (0.066)
Time dummies	No	Si	No	Si
Obs.	413	413	413	413
Countries	28	28	28	28
R ²				

within	0.313	0.374	0.312	0.374
between	0.092	0.074	0.098	0.781
overall	0.113	0.115	0.120	0.119
Prob>F	0.0000 (57.99)	0.0000 (12.19)	-	-
Prob > chi2	-	-	0.0000 (174.27)	0.0000 (222.78)
Temporal effects = 0	-	F(15, 367) = 2.39 Pr = 0.0026	-	chi2(15) = 37.40 Pr = 0.0011
Individual effects = 0	F(27, 382) = 78.55 Pr= 0.0000	F(27, 367) = 83.41 Pr= 0.0000	-	-

Note: Standard errors in brackets; *** significance at 1%; ** significance at 5%; * significance at 10%

The results show that, depending on the type of environmental indicator examined, the two categories of electrical technologies appear to have a different effect. For emissions of greenhouse gases (GHG), sulphur oxides (SO_x), nitrogen oxides (NO_x) and suspended particulate matter (PM_{2.5}), non-combustible renewables show a negative and statistically significant environmental elasticity for all estimated functional specifications.

In particular, considering the statistical inference on time effects and the results of the Hausman test, a 1% increase in the share of electricity generated by non-combustible renewables corresponds to a reduction of 0.083% for the Kyoto basket, 0.100% for nitrogen oxides, 0.089% for sulphur oxides and 0.190% for suspended particulates. The same result is confirmed for combustible renewables with the following environmental elasticities: 0.055% (GHG), 0.068% (NO_x), 0.083% (SO_x) and 0.120% (PM 2.5).

On the other hand, as expected, technologies from fossil sources (*Fossil*) are positively correlated with pollutant emissions. For all environmental indicators analysed, an increase in the share of electricity generated from fossil sources leads to a positive environmental elasticity: the use of these energy technologies generates an increase in pollutant emissions. The highest value is recorded for sulphur oxides (SO_x) and nitrogen oxides (NO_x), while the lowest value is related to suspended particulate matter (PM 2.5).

4.3. Robustness Tests

As a robustness check, some diagnostic checks were performed. First of all, nonetheless the correlation matrixes for all the pollutants show a statistically significant correlation, the analysis of the variance inflation factor (VIF) for all models reveals the absence of multicollinearity. The mean VIF varies for different pollutants from 1.18-1.19 for the Model 1, from 1.35 to 1.36 for the Model 2.⁶

To avoid biased estimates, Pesaran CD test (cross-sectional dependence), Wooldrige test (autocorrelation) and Modified Wald test (heteroskedasticity) were performed. For all estimated models, the test results provide empirical evidence of the presence of heteroscedasticity and autocorrelation in the error terms. Specifically, the null hypothesis of heteroscedastic errors (Modified Wald test) and the alternative hypothesis of serially uncorrelated errors (Wooldrige test) are rejected for all functional specifications. As for the Pesaran CD test, used to check whether residuals are correlated between the statistical entities analysed, the evidence is controversial. For the Model 1 the results of the Pesaran CD test lead to the rejection of the null hypothesis for all estimated equations.

The empirical evidence changes when combustible and non-combustible renewables variables are added (Model 2): the null hypothesis is accepted exclusively for models with GHG. The results of the diagnostic tests for heteroscedasticity and autocorrelation, on the other hand, are

⁶ Available upon request.

homogeneous for all the estimated models: the presence of heteroscedastic and serially correlated errors is evident.⁷

6. Conclusion

Electricity production and consumption are increasing rapidly and electricity renewables, driven by incentive policies, have recorded high growth rates in European countries. However, due to high initial costs and highly variable productivity, especially of wind and photovoltaics, they have not yet achieved a predominant role in the electricity market.

Although an increasing number of studies, the environmental effect of electric renewables has been scarcely addressed in the literature. In this paper we make an attempt to investigate the environmental effectiveness associated with combustible (biomass) and non-combustible (geothermal, wind, hydro and solar) electrical renewables, to see if this disaggregation corresponds to a dissimilarity in the emissions abatement process.

Using a panel of twenty-eight European countries, in the period 1995-2015, we estimate multivariate models that take into account four different environmental indicators: Kyoto basket (GHG), nitrogen oxides (NO_x), sulphur oxides (SO_x) and suspended particulate matter (PM 2.5). The variables of interest include electricity generated from fossil sources (oil, natural gas and coal) and electricity from renewable sources. The latter are disaggregated in the share of electricity from combustible renewables and from non-combustible renewables. Due to the presence of heteroskedasticity and autocorrelation, the estimates are obtained by means of panel models with fixed and random effects and standard errors for clustered data.

The results confirm that electrical renewables play a strategic role in abating pollutant emissions in European countries; for each environmental indicator, the share of electricity generated from renewable sources shows a negative and statistically significant elasticity. We are led to conclude that the disaggregation between combustible and non-combustible renewables presents differential effects: non-combustible renewables present higher elasticities than those associated with combustible renewables.

The difference of the environmental impact between renewable and fossil technologies suggests that the European directives aimed at increasing the share of renewable energy represent an effective policy for combating polluting emissions. The results of this study confirm that the most effective strategy in pollution abatement is that promoting technologies using non-combustible renewable electricity. As known, renewable non-combustible technologies, with the exception of hydropower, is a decentralised generation system represented by numerous small to medium-sized plants. This element of decentralisation, as opposed to the centralised generation that has historically dominated the electricity market, also constitutes an element of innovation for electricity operators. This may explain the result that the environmental elasticities of non-combustible renewables are higher for air polluters than for greenhouse gases. We detect, therefore, a process that sees energy solutions of high ecological value that are replacing pre-existing arrangements thanks to their ability to reduce the use of natural resources.

⁷ The results of the tests for Model 1 and Model 2 are available upon request.

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Study on the Impact of Post-pandemic Effects on the Quality of Accounting Information

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Abstract

The COVID-19 pandemic has affected the economic environment having multiple effects on all industries to a lesser or greater extent. An immediate example would be companies operating in the tourism, hospitality, leisure, and retail industries. Some of these companies have recorded major decreases in income caused by the measures imposed by the quarantine, the closing of schools, as well as the changes in consumer behavior, an effect of social distancing.

The felt economic impact is embodied in a general economic slowdown that includes but is not limited to, financial market volatility and erosion, credit deterioration, liquidity concerns, continued increase in government intervention, rising unemployment, the general decline in consumer discretionary spending, increasing inventory levels, reducing production due to reduced demand, layoffs, and other restructuring activities. The continuation of these circumstances could lead to an even broader economic slowdown that could have an adverse effect on an entity's financial results.

Keywords: Accounting information, transfer pricing, fixed assets, financial reporting

1. Introduction

The COVID-19 pandemic has caused an unprecedented slowdown in economic activities due to quarantine, social distancing, travel restrictions, etc. While it goes without saying that personal safety remains the number one priority, the economic costs of the pandemic are gigantic. Our fundamental assumption is that economic sectors have been unevenly affected by the crisis. We anticipate that some sectors, which even before the start of the pandemic were making extensive use of remote work and e-commerce, may see an increase in turnover, but the absolute majority of enterprises, which operate according to traditional business models, have been severely affected.

Economic losses resulted from the decrease in sales volume against the background of keeping fixed costs and semi-variable costs at the same level. Leasing, loan interest, and payroll expenses remain largely constant, even as sales volume declines. Some costs are semi-variable, such as labor remuneration, which can be controlled to some extent by redundancies and forced furloughs. At the same time, the costs related to the procurement of raw materials, electricity consumption, and others vary to the same extent as the turnover. But even if such spending can be optimized during the recession, the consequences for an integrated economy remain extremely negative – raw material purchases by some enterprises are in fact the core sales of other enterprises, so the negative impacts produce a chain reaction.

Liquidity deficit is a major concern for most businesses and ultimately leads to an increased risk of insolvency. Here we also expect a negative impact on the quality of the bank's loan portfolio, even if the reasonable decision to allow commercial banks not to reclassify loans to non-performing loans during the state of emergency would be welcome for the purpose of not allowing interest rate increases.

The major challenge of the national economy is to adapt to the conditions of the pandemic that does not seem to disappear soon, to reinvent itself, emerge from the created situation, to

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innovate where markets and traditional business management methods are no longer successful. We are aware that many will not take up the challenge, but it is common sense that when we introduce public money into the equation, we do it in such a way that what we build as a result of targeted and wise public policies lays the foundations of a new economy – more advanced in the technological chain, more resistant to internal and external shocks, more environmentally sustainable. At the same time, the public sector should also be reinvented, radically changing regulatory approaches and interactions with the private sector, as other states are urgently doing in order to maintain a competitive position and avoid deep social-economic shocks.

In this study, we aimed to examine "under the lens" the effects of the pandemic on the national economy, to highlight those sectors which, being crucial for economic development, suffered the most, and above all, to identify smart solutions for economic recovery. It is axiomatic that even if an unprecedented situation calls for an unprecedented intervention by the state, budgetary, human, private capital, and other resources are limited. A first impulse on the part of the business environment is to ask for support from the authorities, but providing such support indiscriminately risks perpetuating the effects of the crisis and producing persistent structural effects.

In order for the exercise we propose to make sense of, it is necessary to first understand what the national economy was before the pandemic, what were its characteristic features and what were its strengths and weaknesses. In accordance with the proposed methodology, we will try to highlight the contribution of sectors to economic development and the extent to which they have been affected by the pandemic.

Secondly, we must be aware that, on the surface, the absolute majority of economic sectors have faced a decrease in the volume of sales. This required them to take drastic measures: 1) to optimize costs, including through staff reductions; 2) postpone investment projects; 3) drastically reduce development and promotion budgets; 4) to identify new avenues and markets. We realize that overall such forced "adjustments" will accelerate the speed of recovery in economic growth. However, the systemic problems faced by various economic sectors are fundamentally different. No one knows the magnitude and specifics of today's challenges better than the representatives of the business environment.

Thirdly, the specific problems require intelligent solutions: adapted to the realities faced by the business environment and capable of taking the national economy to a new level of development. One way to inform us about measures relevant to the crisis was to analyze the economic and fiscal incentives put in place in other states affected by the pandemic crisis.

2. Literature Review

Transnational posting of workers in the provision of services was and is a subject very often debated by specialized literature on the subject due to the fact that this phenomenon has grown in recent years, and the Directive that regulates it, 96/71/EC, was drawn up more than 24 years ago and its provisions require improvement and updating. From the desire to clarify, at the level of the European Union, the effects arising as a result of the transnational posting in recent years, we are assisting in the elaboration of Directives and Regulations that must be transposed into the legislation of the member states.

Since ancient times, concerns have been identified regarding the evaluation and reflection as accurately and faithful as possible of operations related to human resources in accounting and implicitly in financial statements. The oldest concerns date back to the 1960s and had as their starting point the identification of the main aspects that underpin human resource accounting, and then the attention of researchers and specialists in the field focused on human resource evaluation methods and the development of accounting treatments and policies in the matter.

Proposals regarding the possibilities of accounting for human resources are varied, from the proposal to account for human resources as valuable assets (fixed or current) or as investments of the entity respectively recording transactions related to human resources on account of current expenses.

The exemplification of the method of identifying the accounting information on the basis of which the phenomenon of mobility of human resources in the Republic of Moldova is accounted for highlighted the fact that, along with a series of national laws (the Law on posting of employees, the Labor Code, the Fiscal Code), the professional accountant must know very well the European regulations of the member state where the employee is delegated.

IAS 19- Employee benefits bring additional clarifications in the case of short-term benefits (salaries, holidays), post-employment benefits (pensions), other long-term benefits (long-term service leave), and termination benefits through the standard international accounting. In our opinion, the analytical accounting for the mobility of the human resource must be clearly inscribed in the accounting policies, so as to allow the provision of distinct information on the actual expenses at the level of posted workers, but also by types of expenses.

3. Analysis of the Sectors of the National Economy

The methodology for analyzing the economic impact produced by the pandemic on the sectors of the national economy aims to contrast three basic dimensions:

- Contribution to the economic development of the sectors;
- The impact of the pandemic crisis on economic sectors; and
- The degree of resilience of some sectors to the shock of the crisis.

The sectors of the national economy subject to analysis are the sectors included in the CAEM whose turnover has a weight higher than 1% of the total turnover of the real economy. For the purpose of the analysis, we define the real economy as that contained in the sectors where private capital predominates (excluding public administration, education, and health care). Following this methodology, we will cover about 88% of the real economy. There are 5 basic criteria to define the contribution to the economic development of the sectors included in the CAEM, namely:

- a) the size of the sector defined according to the number of employees and turnover;
- b) economic performance in terms of labor intensity and productivity;
- c) the role in ensuring food security and other strategic aspects;
- d) importance for other sectors of the national economy;
- e) import substitution potential;
- f) export growth potential.

The size of the sector will be determined by two indicators: the number of employees in 2021 and production/turnover in 2022. The basic premise in using these indicators is that those sectors that contribute heavily to job creation and GDP demand more attention from the public authorities because:

- keeping jobs is closely related to the level of household income;
- turnover significantly contributes to the formation of budget revenues.

The performance of the sector will be calculated according to:

- labor intensity (turnover relative to the number of employees) and

- labor productivity (gross value added relative to the number of employees). The logic of this indicator is that the more technological sectors, which produce more added value, contribute in a more pronounced way to economic growth.

In the conditions of the pandemic, food security and public health play an increased role. We will consider as very important those sectors of the economy that directly contribute to food security and public health, including agriculture, the food industry, the pharmaceutical industry, and the medical system. Of medium importance will be considered sectors that are indispensable for the functioning of any economy, such as financial intermediation, energy and water supply, and transport. From the perspective of this criterion, the other sectors will be considered of low importance.

The importance for other sectors of the national economy lies in the need to prevent chain reactions. From a theoretical point of view, an isolated enterprise is a business that risks its own capital, while a highly connected enterprise risks contaminating other sectors. In practical terms, we will approximate the degree of interconnectivity of the enterprises emerging from the number of invoices issued to other economic agents during 2021, the value of invoiced transactions in 2021, and the share of internal consumption in 2021.

Import substitution potential is a criterion whose importance increases under the conditions of the pandemic. A policy that is gaining momentum worldwide is related to decreasing the degree of dependence on imported goods and services. We would like to point out that import substitution is not seen here as a measure to protect local producers - but as an ability to provide the local market with goods and services in conditions of limited access to the world market. To measure 81 the import substitution potential we will use the ratio between the sales of goods and services on the local market (turnover minus export) and the domestic consumption of goods and services (turnover minus export plus import) from the unit.

Export potential is manifested when the world economy shows an increased demand for imported goods and services, a demand that can theoretically be satisfied by the sectors of the national economy that have the capacity to produce those goods and services. As an indicator for approximating the export potential, we will analyze the dynamics of imports of goods and services in the main partner countries and assign the categories of goods and services that are growing in the first five months of 2022 compared to 2021 to those sectors that have the capacity to produce those goods and services.

In the part related to the impact of the pandemic crisis on the national economy, we will focus on the seriousness of the economic losses recorded by companies following 6 impact criteria: (a) the extent to which national restrictions and changes in local consumption have affected the number of employees; (b) the extent to which national restrictions and changes in local consumption have affected production/turnover; (c) the extent to which foreign trade has been affected by global mobility; (d) the risk of insolvency in economic sectors; (e) financial sustainability of the branches of the national economy; (f) access to new loans from the banking system.

Similarly, but with a number of specific peculiarities, many economic agents have experienced a significant decrease in production/turnover due to national restrictions. This occurred due to the lack of physical access to points of sale (access to e-commerce has benefited certain economic agents who continued to make deliveries online), the reduced presence of staff at workplaces, and the change in consumer preferences and priorities, being anticipated a major impact in the March-May period compared to the corresponding period of the previous year.

Of a different nature is the impact generated by the decrease in foreign trade. Changes in consumer preferences, the decrease in purchasing power, and, consequently, the decrease in the

number of orders contributed to its evolution. Difficulties in transporting goods had a temporary impact, but the cancellation of flights had a drastic impact on tourism-dependent sectors. We anticipate that the impact on turnover has not yet fully manifested itself, given that the import/export operations were carried out on the basis of orders made in the period before the pandemic. To capture the economic impact we will resort to the reconciliation of statistical data on foreign trade (import and export of goods and services) with the sectors of the national economy (types of activities).

Another category of impact is the risk of immediate insolvency, dictated by the losses recorded since the beginning of the pandemic. In this case, we will use the ratio of the turnover for 2018 adjusted with the decrease in sales from March-May minus fixed costs (depreciation, labor remuneration, interest, rent, energy, telecommunications, banking, and services in 2020) minus the cost of procurement of goods sold (2020 adjusted for the impact on turnover in March-May) and assets (2021) minus liabilities (2021) (% , source NBS). Our assumption is that the costs of products sold are not very elastic, being mostly fixed and semi-variable costs.

In addition to solvency, which is an extreme test of survival in the conditions of the pandemic crisis, we will also analyze the financial sustainability of economic sectors, which determines their ability to attract financing during the pandemic crisis. As an indicator of financial sustainability, we will examine the share of non-performing loans (doubtful and compromised) during the pandemic (March-May). The statistical data provided by the NBM allow the analysis of these indicators by branches of the national economy, respectively we will extrapolate the share of non-performing loans to the economic sectors that are part of the respective branch.

The last, although no less important criterion, relates to access to new loans. We will assess the extent to which access is constrained based on the percentage change in the balances of credits issued by branches of the national economy for the months of April-June 2022 compared to April-June 2021. Access to credits is most constrained in the branches of the economy for which the change in balances is negative. In order to synthesize a comprehensive picture of the evolution of the sectors during the pandemic, we will also refer to the third dimension, namely, the degree of resilience of the sectors in the conditions of the partial recovery of economic activity.

4. Prioritization of the Sectors of the National Economy

In order to prioritize the sectors of the national economy for the application of economic and fiscal incentives we will focus on the three dimensions specified in point A, namely: the contribution of the sector to economic development, the impact of the pandemic crisis on the sector and the resilience of the sector to the "new normality". For this purpose, we will assign a score from 1 to 100 for each criterion analyzed based on the proposed indicators. Thus, the score for the size of the sector (represented by 2 indicators - number of employees and turnover) will be calculated as the average of the scores for each of the two indicators, according to the following formula:

$$Sa1 = \frac{(100 \times Ns - Nmin \ Nmax - Nmin + 100 \times Vs - Vmin \ Vmax - Vmin)}{2},$$

where:

Sa1 – Score for sector size;

Ns – Number of employees in the respective sector;

Nmin – Number of employees in the sector with the fewest employees;

Nmax – Number of employees in the sector with the most employees;

Vs – Turnover (sales volume) in the respective sector;

Vmin – Turnover in the sector with the lowest sales;

Vmax – Turnover in the sector with the highest sales.

Similarly, the scores for each of the 5 economic development contribution criteria specified in section A will be assigned, and respectively, the scores for the 5 impact criteria specified in section B, as well as the resilience score in section C will be assigned. The average of the scores (possibly the weighted average if the results of the analysis revealed that some criteria are more important than others) on the 5 importance criteria will constitute the score (Sa) for the importance of the sector, and the average of the scores on the 5 impact criteria (Sb) will constitute the score for the impact of the pandemic on the sector. In case of abnormal indicators, we will use the values in their vicinity. The graphic representation (random scores are indicated in the figures below) for each analyzed sector will be a diagram according to the following model:



Figure 1. The contribution of the sector to the development of the national economy



Figure 2. The impact of the pandemic crisis on the sector

5. Elaboration of anti-COVID Economic and Fiscal Policy Measures

A comprehensive set of policies aimed at stimulating the national economy is at the juncture of a good coordination of the process and an appropriate selection of structural, economic, and, fiscal measures. Currently, there are several development partners who have the mandate to design public policy interventions based on their own objectives. For example, a team hired by the UNDP is trying to determine the extent to which the pandemic has affected vulnerable groups of the population. A similar mission is coordinated by the Ministry of Economy. In order to achieve synergies, avoid duplications and harmonize communication, the analysis proposed by the Economic Council will also reflect the results of the work carried out in parallel by such teams.

In one way or another, all countries in the world are trying to face the challenges generated by the COVID-19 virus pandemic. Depending on their financial strength, strategic positioning in the world economy, and the severity of the crisis, several governments have developed sets of economic, monetary, and, fiscal measures that:

- ✓ enable the survival of important sectors;
- ✓ are commensurate with the severity of the losses recorded by economic agents;
and
- ✓ promote resilience and stimulate the relaunch of economic activity in affected sectors.

Another source of information for the development of policy measures is the analysis of the needs of the beneficiaries of economic and fiscal incentives. A number of surveys have already been carried out by other development partners (or are in the process of being carried out). We will use the results of the existing surveys to develop the descriptive part for each sector and facilitate, thus, the understanding of the mechanism through which the crisis developed, as well as the specific impact on employment, other sectors, foreign trade, etc. In addition to the data from the survey, we will organize dedicated interviews with experts in the field and representatives of the targeted sectors. It should be noted that the Economic Council attached to the Prime Minister already has a network of experts that can be accessed for this purpose. Moreover, the Economic Council has already accumulated around 400 proposals from the private sector, which include both desperate calls for help and concrete policy measures.

Considering the current economic context and the interim reporting requirements that companies must prepare in the coming period, companies have the mission to identify and reflect in the financial statements the impact of the pandemic on the company's activity.

Increasing the economic transparency of entities that practice controlled transactions [5], as well as monitoring the risk assumed in relation to the existing risk at the date of the transaction and financial stability in the case of fiscal control operations [7] by referring to a concrete methodological basis [5], demonstrable and justifiable under the conditions of a possible tax dispute, acquires a methodological relevance by standardizing the stages of creating a Transfer Pricing File.

The transfer pricing file contains the main elements of influence on transactions and the summary results of the economic analysis regarding the method used, the profitability indicator [7], and the results of the analysis for each good or service that was the subject of transactions between related parties [5]), including the economic justification of transactions of insignificant value [7]. On the other hand, the preparation of the transfer pricing file can be found in the package of accounting policies as a separate chapter in the conditions where the entity is affiliated with an economic-financial group.

From a methodological point of view, in order to quantify the risk added to transactions controlled with related parties according to IAS 24 [2] at the date of financial reporting [2] we proposed the development of the acid test model for the evaluation of risk markers, which could be included in the package of accounting policies. This aspect must be analyzed both from the perspective of policies to strengthen risk detection behavior and from the point of view of economic dynamics (facing successive periods of economic growth or economic crisis), aspects that change the behavior of entities in the sense of adapting to these 108 regulatory measures and identifying possibilities for maximizing economic interest.

Thus, we consider that the approaches regarding the operational delimitations of the economic bodies resonated generically with the interests of the entities, especially those in a dependency relationship through affiliation or joint venture by creating circular transactions, concealing losses and/or profits or by creating functions with a destination non-economic (referring among others to forms of social protection or advantages obtained through their indirect use). It follows that the conceptualization of a model for valid identification of fiscal risks, especially regarding transactions with related parties, represents a necessity that resonates both with the interest of entities with attributions in the field, and with the interests of multinational corporations that want to implement the principles of sustainable development at all levels of the entity.

The first category of economic indicators is represented by the indicators for detecting the benefit threshold. This category of indicators is quantified both on the basis of the principle of the functioning of the economy (beneficial and perpetual economic growth), and on the basis of the principle of prudence or the reasonable basis of opinion. The principle of beneficial and perpetual economic growth is based within an internationally developed entity (multinational company) on ensuring at all times the interest of the interested parties.

From a mathematical point of view, the evaluation of the interest of the interested parties based on the mentioned principle resides in the prospective evaluation of the recovery of the investment through financial forecasting methods and in the reasonable evaluation of capital protection through retrospective methods of analysis of capital depreciation and/or erosion in relation to the rate of presumed accumulation. Methodologically, the quantification of the achieved benefit must be related to a minimum of the presumed benefit under conditions of constant fiscal risk.

Certain elements can be taken into account when establishing the basis for predictive assessment of the presumed technical benefit:

- the transfer of intellectual property rights from one state to another;
- relocation costs;
- changes in the royalties obtained through the transfer of intellectual property.

The principle must be completed with the assessment of the assumed risk by identifying and isolating the risk elements of transactions in relation to the risk of fraud and error or changing the structure of global value chains as an indicator of macroeconomic vulnerability. In addition to the risk analysis, the elements that involve financial risk must be evaluated and separated from those that involve fiscal risk.

In conclusion, economic indicators for detecting potential risk generate non-zero values if and only if the presumed benefit threshold is not exceeded. The second category of indicators is the economic indicators for detecting the specific features of a controlled transaction, which include certain generic characteristics such as:

- the existence of confidentiality clauses in transactions controlled by the extent of affecting the fiscal transparency of transactions established by the specific legal framework;

→ the transformation of the material form of some financial elements, such as the transformation of the goodwill into participation by using the right of pre-emption, the use of taxable income for donations in order to reduce tax expenses;

→ the flow of commercial transactions based on modern principles, such as the concept of circular economy, where related parties can obtain certain advantages as a result of extending the life cycle of products;

→ tax residence and the tax treatment applicable to transactions, if and only if there are elements of uncertainty regarding tax residence in a non-cooperative state or in tax havens;

→ vulnerabilities of transaction assurance elements.

The third category of indicators addresses double taxation issues and identifies the associated risk by assessing tax deductions (eg claiming asset depreciation deductions in multiple tax jurisdictions). Another way of identifying the risk is the identification of the elements of income or capital, for which the exemption from double taxation operates in several jurisdictions, or the evaluation of flaws in the application of the principle of permanence of methods in the case of transfers of assets through international commercial transactions.

The fourth category of economic indicators shows compliance for informational risk (international financial transfers interrupted by the transit of a tax haven, reclassification of income in elements with high volatility, likely to evade international reporting. A significant category of informational risk is represented by legal chain arrangements, which may include transactions with parties in insolvency or reorganization or, more dangerously, with fictitious legal entities. The fifth category of economic indicators for identifying risk is aimed at the specifics of controlled transactions and contains generic elements such as:

- the identification of arrangements for the use of unilateral norms (safeguard arrangements);
- identification of diffusely evaluated intellectual property transfers (transfers of intangible assets to be produced after the date of conclusion of the agreement);
- identifying the elements traded on the basis of the promise to generate future financial flows or anticipated income for which there were no certain elements at the time of the conclusion of the agreement.

Given the wide range of government measures undertaken, the first challenge faced by companies benefiting from financial support from the State was to determine the applicable IFRS standard. Among the measures taken, we can mention: the implementation of partial unemployment or days off granted to parents to supervise children, in the event of temporary closure of educational units, etc. Therefore, an individual case-by-case analysis is required to determine the applicable standard: IAS 20 - Accounting for Government Grants and Disclosure of Government Assistance, IAS 19 - Employee Benefits, IFRS 15 - Revenue Recognition, and IAS 12 - Income Tax.

In certain situations, uncertainties were identified regarding the application of IAS 19 or IAS 20. The application of IAS 20 is justified in the situation where a company acts on its own account and receives aid from the State to pay wages, based on an employment contract. In practice, if the State verifies that the eligibility criteria are met and in the situation where a company has not met the criteria, it must return to the State the undue amounts collected. The aid received from the State will be presented in accordance with the accounting policy previously adopted for other subsidies received. In practice, these will be accounted for either as other income or as a reduction in salary expenses.

The application of IAS 19 is justified in the situation where the company pays the employee a substitute income on behalf of the State, money that will later be reimbursed to the company by the State. In other words, the company has an agent role on behalf of the State and will not benefit from subsidies in its own name. The aid received must be presented as a deduction from salary expenses.

The difference of the environmental impact between renewable and fossil technologies suggests that the European directives aimed at increasing the share of renewable energy represent an effective policy for combating polluting emissions. The results of this study confirm that the most effective strategy in pollution abatement is that promoting technologies using non-combustible renewable electricity. As known, renewable non-combustible technologies, with the exception of hydropower, is a decentralised generation system represented by numerous small to medium-sized plants. This element of decentralisation, as opposed to the centralised generation that has historically dominated the electricity market, also constitutes an element of innovation for electricity operators. This may explain the result that the environmental elasticities of non-combustible renewables are higher for air polluters than for greenhouse gases. We detect, therefore, a process that sees energy solutions of high ecological value that are replacing pre-existing arrangements thanks to their ability to reduce the use of natural resources.

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Economic Development of Russia: Problems and Perspectives

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Abstract

The article makes the analysis of the economic situation in Russia in 2022 and the perspectives of its development in 2023. 2022 has not become as catastrophic for Russia as many experts predicted. A fall in GDP of 2% compared to the estimated 6-10% is not the figure that Western "friends" were counting on. However, the current year, 2023, may become more difficult. A number of events have taken place in 2023 that may affect the Russian economy. The main one is the reduction of budget revenues. This is due to cheaper energy sources - oil and gas. The Russian economy will continue to adapt to the new operating conditions, but this process can be lengthy.

Keywords: economics, Russia, development, problems, risks, perspectives, economic growth.

1. Introduction

2022 has not become as catastrophic for Russia as many experts predicted. A fall in GDP of 2% compared to the estimated 6-10% is not the figure that Western "friends" were counting on. However, the current year, 2023, may become more difficult.

The long-term effect of the sanctions will hit the country's economy this year, many analysts believe. In the article, we will talk about the problems, as well as the factors that contributed to the withdrawal of the Russian economy from the crisis in 2023. After the start of the NMD, Russia faced unprecedented pressure; during the year, 10 packages of sanctions were imposed against us, they have not ended and continue to be introduced to this day (Babin, 2022).

The restrictions affected almost all sectors of the economy, but the strongest ones hit the most sensitive ones - the fuel and energy complex, metallurgy, and finance. The situation was exacerbated by global economic problems: recession, covid in China, higher interest rates by central banks.

It would seem that the Russian economy will not withstand a double blow and will fall into the abyss. But the actions of the government and the Russian Central Bank, as well as high energy prices, made it possible to stay afloat and even increase budget revenues. In order not to be unfounded, let's analyze the state of a number of major industries (View, 2022).

The situation in the construction industry is twofold. On the one hand, housing was actively built in 2022: Russian records for the commissioning of new housing were broken - about 100 million square meters. m. On the other hand, the demand for new apartments has decreased and they are gradually, without sharp collapses, but getting cheaper. The decrease in purchases is a consequence of falling incomes of the population, uncertainty about the future, and expectations of further price reductions.

Separately, we single out the construction of infrastructure facilities. Here the main sponsor is the state. GAZPROM excelled, which, after problems in Western markets with the sale of its products, began to actively implement projects such as the Power of Siberia, redirecting excess gas to the countries of the Asia-Pacific region. Exports to India and China have grown significantly, production quotas have been increased, investments have increased (Galperin, 2018).

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This also includes the active construction of bridges, roads, airports, and other facilities. The growth in consumption of rolled metal products in this sector amounted to +28% (Herzena, 2020).

In the Russian fuel and energy complex, everything was also not entirely smooth. At the end of the year, oil production increased by 2%, exports - by 7.6%. But processing fell by 3%. Gas exports via the Power of Siberia gas pipeline increased by almost 50%, but overall exports fell by 25%, due to a decrease in fuel sales to the west. But in monetary terms, everything is not bad - this is due to the high prices for blue fuel in 2022 (Business world, 2022).

The coal industry was the first to feel the effect of the sanctions, but in a timely manner managed to redirect flows to Asia, primarily to India and China, and, as a result, produced raw materials at the level of last year. The decline in exports still occurred by 7.5%, but due to an increase in purchases within the country by 12%, the losses were leveled (Evstigneeva, 2021).

Demand for electricity remained at the level of the previous year, including due to the accession of new territories where the restoration of electricity supply was actively going on. Electricity production in the country increased by 0.7% (Kanareikin, 2020).

In 2023, metallurgy and, first of all, the steel market were seriously affected. The problems affected not only Russia, but also global production, but the Russian crisis turned out to be stronger. For example, by June, year-on-year steel production decreased by 15%. However, then the situation leveled off somewhat and the decline slowed down: at the end of 2022, indicators decreased by 7.2%. If taken separately by companies, then the indicators are at the same levels, for example, Severstal ended the year with an 8% drop (Klimanov, 2021).

Mechanical engineering in Russia last year suffered the most, with a decline of -18% over the year. The main reasons for the sanctions were observed: parts shortage, complicated supply, stop part of the production, OEM withdrawal from the Russian market.

This industry felt better than others, which is logical: any import bans lead to the activation of local producers. The overall growth in agricultural production amounted to 10.2%, of which in crop production - + 15.9%, in animal husbandry - + 2.4% (Kovalev, 2022).

Freight transport for all transport decreased by 1.2% in 2022, with a different picture for each type (Kozlo, 2023).

Despite the sanctions imposed on Russia by Western countries, the Russian economy did not collapse, but survived - this is also evidenced by the rather slow decline in GDP.

There are several reasons for this.

a) Underestimation of Russian GDP. According to the French publication Marianne, the GDP of Russia and Belarus is only 3.3% of the sum of the economies of the USA, Canada, Australia, New Zealand, Great Britain, the European Union, Norway, Switzerland, Japan and the South Korea. Against this background, it seems that Russia's GDP is insignificant, but this is only an appearance. With the help of a well-known tool, not actually produced goods are measured, but the entire volume of goods, including intangible ones. An impressive part of them are "useless" devices (for example, in the US, drug prices are too high compared to other developed countries). In other words, the Russian economy is not so small compared to the economies of "unfriendly" countries.

b) The special role of agriculture. For example, in the United States from 1980 to 2021, the grain harvest fell from 65 to 47 million tons, while in Russia production increased from 36.9 to 80 million tons during this time. As experts emphasize, growing wheat and selling gas allows Russia to stay afloat better than the United States with its struggling economy.

c) Problems of Europe against the backdrop of anti-Russian sanctions. As Hungarian Prime Minister Viktor Orban noted: usually the stronger side imposes sanctions against the weaker side. But if we turn to energy, the weak states of Europe have imposed sanctions against the giant in this area. This can only lead to negative consequences.

In addition, the Russian economy withstood the crisis thanks to the accumulated safety margin. For example, in 2021 the budget was reduced to a surplus, and banks received more than a trillion rubles in net profit. Large companies are trying to reorient themselves to the countries of the East, and are also looking for ways to circumvent sanctions restrictions.

2. Analysis of the development of the economic situation in 2023

A number of events have taken place in 2023 that may affect the Russian economy. The main one is the reduction of budget revenues. This is due to cheaper energy sources - oil and gas (Kreisberg, 2023).

Reasons for lower prices: warm winter and windy weather, which allows wind turbines to work in an enhanced mode. Thanks to this, gas reserves at the beginning of winter, for example in Germany, amount to almost 80%, which is a rarity for spring (Tsagolov, 2019).

A decrease in budget revenues is bad for any country, especially for a military one. Expenses for the military-industrial complex will not decrease, but they can be cut for the construction of infrastructure facilities and housing, which will affect, among other things, the Russian metallurgy (Ledeneva, 2023).

Doctor of Economic Sciences, Professor Igor Lipsits summarized the results with which the Russian economy enters the second half of 2023. The stability of the system, bravura economic indicators are an illusion. The Russians have not yet fully felt the effect of the sanctions and the NWO.

Igor Lipsits notes that the forced throw into the arms of Eastern partners did not save the Russian economy. The cash gap in the budget can initially be closed, for example, at the expense of the National Welfare Fund. as the economist has already predicted, then the state, as the treasury becomes impoverished, will begin to borrow from ordinary Russians.

“The standard of living will fall, investments in the civilian economy will decline, many businesses will become unprofitable and close. The economy will deteriorate, but there will still be money for the army, military equipment and law enforcement agencies. And all this will be paid for by the population of Russia in the most direct way - through taxes, inflation and the devaluation of the ruble. What, in fact, is already happening, ”is his forecast.

According to Rosstat, the industrial production index in the first quarter of 2023 was 99.1% compared to the same period last year. The positive dynamics was provided by industries where the output of products related to the defense industry was actively expanding. Everything is tolerable in agriculture.

“In other industries, things are very bad: manufacturing and mining have shrunk and are struggling to recover, oil revenues have declined. Gazprom is at a loss, with big problems on the horizon with diamonds. And even in the fertilizer market, the clouds are gathering. The Russian state is trying to find new markets for the metal. At the same time, ferrous metals cannot be supplied to India, because the ferrous metallurgy there is larger and stronger than in Russia. The Indian company ArcelorMittal is No. 1 in the world in steel smelting, and the largest Russian manufacturer NLMK is only in 17th place, ”reminds Lipsitz (Ledeneva, 2023).

He also notes that in the domestic mining industry, only the extraction and production of building materials have grown significantly. “And this is understandable - gravel, cement and other materials are needed to create defensive structures,” the professor specified.

3. Forecasts for the future economic development

2023 will be a difficult year for the Russian economy and metallurgy in particular. Cheaper gas, the introduction of a ceiling on oil prices means a reduction in revenues and a shortfall in budget funds. And this will lead to difficulties in the implementation of infrastructure projects planned by the government, which will hit, including the metallurgy. You will have to get money from inviolable funds (Ledeneva, 2017).

The commissioning of new housing is planned in the same volumes, but we are unlikely to see new records. At the same time, the state is doing its best to stimulate the purchase of real estate by extending the mortgage grace period until mid-2024.

Metallurgists can be supported by the military-industrial complex, which works in an enhanced mode during hostilities, as has been repeatedly said in the government. Military spending will be increased to 17% of total spending (Lipsitz, 2022).

In general, the state of the Russian economy will primarily depend on the progress of the SVO, the longer the special operation lasts, the greater the likelihood of receiving another package of sanctions from unfriendly countries. However, the sanctions effect has largely exhausted its potential, further restrictions will no longer have catastrophic consequences.

The global economic crisis has affected the Russian economy, and it will continue to influence the state of affairs. We look at China, inflation, which, after the measures taken by central banks, began to decline, at a further increase in interest rates.

The decline in Russian GDP will be 2-3%, collapses in the form of a 5% or more fall are unlikely to happen, and growth is likely in 2024. But all forecasts can be confused by the aggravation of the geopolitical situation - in the Russian-Ukrainian conflict, in Taiwan, in other hot spots (Yeghiazaryan, 2021).

The Russian economy will fall by 2% in 2023, but in the coming months we should expect a lower point of decline. This forecast was given by the Eurasian Development Bank. The main risk for Russia remains the EU oil embargo.

After a 3% decline in 2022, the Russian economy will slow down to minus 2% next year, and in 2024 it will enter a growth trajectory of 1.5% of GDP. Inflation at the end of 2023 will slow down to 6% (from 12.6% in 2022) and approach the target level of 4% in 2024. Such a forecast in the baseline scenario was given by analysts of the Eurasian Development Bank (EDB), whose participants, in addition to Russia, are Belarus, Armenia, Kazakhstan, Kyrgyzstan and Tajikistan.

According to Aleksey Kuznetsov, Head of the Country Analysis Center of the EDB Directorate for Analytical Work, the Russian economy is not contracting as rapidly as previously expected, mainly due to the oil sector, which turned out to be more resistant to sanctions pressure. However, the main factor of uncertainty for the next year remains the upcoming introduction of the EU oil embargo as part of the sixth package of sanctions against Russia.

The ban on offshore supplies of Russian oil to Europe comes into force on December 5, 2022, and from February 5 it will apply to all oil products. Together with the embargo, the EU and other G7 countries are going to ban their companies from providing transport, insurance and financial services for the purchase of Russian oil by third countries at a price above the limit. The embargo will cost Russia 1.5-2% of GDP next year, Kuznetsov said.

In its May forecast, the EDB expected a decline in Russian GDP by 7% this year and 3% next year. The improvement in estimates comes as the Russian economy has been helped by the resilience of oil production, expansion of construction and an increase in the grain harvest, the new forecast says.

5. Conclusion

To conclude, the Russian economy will continue to adapt to the new operating conditions, but this process can be lengthy, the EDB warns. “Industrial and logistics chains are highly likely to remain disrupted next year, including due to complicated settlements and the receipt of other financial services. This will limit domestic demand,” the review says.

Together with heightened uncertainty about the economic outlook, delays in the alignment of the supply chain and difficulties with financial transactions could result in a gradual deepening of the economic downturn in 2023 and stagnation thereafter in the worst-case scenario. “The implementation of such a scenario is unlikely to be accompanied by a sharp drop in GDP and a deterioration in the living standards of the population, however, economic indicators may decline, and the gap from developed countries may increase,” the forecast says.

At the same time, the possibility of a partial easing of sanctions cannot be ruled out, which could lead to a recovery in the growth of the Russian economy as early as by the end of 2023, EDB analysts expressed hope.

In the near future, the Russian authorities and business will have to solve three groups of interrelated tasks. First, providing the domestic market with the necessary goods, restoring value chains through alternative partners. Secondly, to create reliable financial mechanisms for cooperation with these partners. Thirdly, look for new growth points for the future, industries where dependence on the West was critical.

It is important to find opportunities for new partners to enter the markets and attract investors from friendly countries, as well as try to integrate into new value chains.

Future partners are primarily China and India. The southern direction is also not unpromising - firstly, these are Iran and Turkey as trading partners, the search for investors in the Arab world and the development of logistics routes through the Middle East. The most important obstacle in all areas is still the threat of secondary sanctions from the US and the EU, which means that the second task becomes the most important - to build a secure infrastructure for financial interaction.

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Labor Market and Economic Trends in 2023

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Abstract

The labor market reflects the situation in the world and the country. Since 2020, it has been affected by the pandemic, demography, geopolitics, and economics. In Russia, there has been a change in the main HR strategy that employers adhere to when planning activities for the next year. Now at the forefront is not the selection of new employees, but the retention of existing personnel. The key problem for the Russian labor market in 2023 is an acute shortage of qualified personnel. Indirectly, this problem is evidenced by the record low unemployment rate.

Keywords: labor, labor market, employment, economics, Russia, development, problems, risks, perspectives, economic growth.

1. Introduction

In 2021, the pandemic "stagnation" has by and large passed, and the market has begun a slow recovery. Job portal HH reports that almost half (45%) of Russian companies hired employees, and 56% raised salaries. But only 37% of employers managed to maintain their previous level, and employees of 68% of companies were forced to update their resumes and change jobs (View, 2022).

At the end of 2021, almost everyone was confident that the market had finally stabilized and the trends would continue. Most Russian companies planned to retain and expand their staff, as well as increase the income of specialists. As for employees, almost half were ready to change employers, expecting that this move would also lead to an increase in income.

In 2022, the Russian labor market experienced several shocks at once. First of all, the imposition of sanctions, the departure of Western employers and at least two waves of relocation. An acute crisis was avoided: unemployment at the end of last year and the beginning of this year was at record low levels. But in 2023, the labor market will actively adapt to the current conditions. First, the effects associated with relocation will be more pronounced. Secondly, the structure and model of employment will change as the economy transforms, which will enter an active phase this year.

Since the beginning of 2022, we have witnessed how quickly the circumstances and conditions have changed that determined the development of the country's economy and continue to determine it to this day. Moreover, this statement can be safely attributed both to the economy as a whole and to the development of individual industries. Experts say that under standard conditions, the path that the market has traveled in a year, it overcomes in several years, at least in 3-4 years (Business world, 2022).

The beginning of 2022 was stable and inspiring optimism, because January-February passed completely according to experts' forecasts, while remaining committed to past trends. And then in February we learned about the start of a special military operation.

From that moment on, both the Russian economy and the labor market began to "storm". The situation fluctuated: peaks in the activity of candidates who remained out of work after the exit of many foreign companies from the market and wage dumping by employers were replaced

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by retention of existing employees and a pause in hiring. Waves of candidate activity in 2022 occurred in March and October, and both waves are logically connected with the start of a special military operation and the announcement of partial mobilization (Evstigneeva, 2021).

Basically, those specialists who have the opportunity to work remotely, as well as those who were sure that they would be able to find a job abroad, left the country. Such candidates, as a rule, had a good command of foreign languages and were constantly in demand in the labor market - in particular, IT specialists who tried to find a place in foreign companies. In addition to them, highly qualified specialists from various industries, as well as managers, left.

To prevent the leakage of qualified IT personnel, the Ministry of Digital Transformation provided clarifications regarding the delay for such specialists. This had a positive effect on the situation: many who had already planned their departure remained in the country. Despite this, the situation with personnel in the IT industry is far from favorable: there has recently been a rather serious shortage of strong and experienced employees, which still persists.

In addition to IT, other industries also “suffered”, the management of which was forced to look for “workarounds” to retain personnel at their enterprises. A variety of options were used, ranging from the transfer of employees to GPC and remote work and ending with the booking of employees who are in reserve. Leaders face a difficult task: globally, to cope with the outflow of specialists, locally, to retain the current staff and replace those who were mobilized (Kanareikin, 2022).

New realities created the need to restructure business processes and quickly adapt to new working conditions. Instead of top managers, employers began to look for strong middle-level specialists. Hiring leaders were IT, Operations, Logistics and Procurement. Professionals from the manufacturing segment were also in high demand. Throughout 2022, high demand for skilled workers also continued.

Given the fact that Russian companies with state participation are booking qualified specialists, in 2022 many candidates sought to find work there.

2. Main Problems of the Labor Market in Russia in 2022-2023

The main labor market trends in 2022 were (Kovalev, 2022):

- 1.The focus of interest of employers in the field of project recruitment of candidates for a specific activity
- 2.Demand for job seekers aged 50+
- 3.Loyalty of employers to a hybrid or remote work format

The key problem for the Russian labor market in 2023 is an acute shortage of qualified personnel. Indirectly, this problem is evidenced by the record low unemployment rate. According to the latest data from Rosstat, in November, the indicator updated its historical low and fell to 3.7%. The problem of shortage of personnel was considered key even before the start of the special operation. For example, the Central Bank Chairman Elvira Nabiullina called the shortage of skilled labor one of the two main risks for the Russian economy (the second was the low motivation of private investors) at the beginning of 2022. Since February last year, the Russian labor market has experienced at least two waves of relocation: in the spring, after the start of the NWO, and in the fall, against the background of partial mobilization (Kozlov, 2023).

In December, in a press release from the Central Bank, published after the last key rate meeting of the year, the shortage of personnel was again separately noted as a key risk. “At the current stage, the possibilities for expanding production in the Russian economy are largely limited by the state of the labor market. Unemployment hit a historic low. Against the backdrop of the

effects of partial mobilization, labor shortages are increasing in many industries. Under these conditions, the growth of real wages is accelerating in them, which may outstrip the growth of labor productivity,” the regulator said in a publication.

According to a survey of the largest companies conducted in October last year by the Russian Union of Industrialists and Entrepreneurs, at the moment, partial mobilization did not create problems with personnel for most organizations: 60% of employers did not notice the impact of mobilization on labor supply. But in the future the effect will increase. 60% of respondents expect the shortage of personnel to worsen due to the impact of mobilization on the labor market (Ledeneva, 2023).

The results of a survey of manufacturing enterprises, published by the laboratory of market surveys of the Institute for Economic Policy. Gaidar in October, showed a record shortage of personnel in the industry. According to the survey data, the indicator of the balance of assessments of personnel sufficiency at the end of the month turned out to be in a deeply negative zone: the difference between the answers “more than enough” and “less than enough” was 28% (Ledeneva, 2017)

The shortage of personnel in the industry was caused by the outflow of personnel as a result of both conscription and evasion of mobilization, the study says. The largest shortage of personnel, as the authors of the report point out, was recorded in light industry enterprises (-70%), in mechanical engineering (-35%) and in food production (-25%).

The previous drop in staffing adequacy scores (-26%) took place in February of this year. But then the authors of the report associated it with the optimism of enterprises regarding a way out of the covid crisis.

One of the most affected by the departure of specialists abroad is the IT industry: according to the July assessment of Deputy Prime Minister Dmitry Chernyshenko, the Russian IT market lacked about 1 million specialists. The construction industry is also experiencing a serious shortage of personnel: in November, the Ministry of Construction reported that the sector lacks about 3 million workers.

In those industries where there was initially a shortage of workers, mobilization has increased its severity, says Alexander Safonov, professor of the Department of Personnel Management and Psychology, Vice-Rector of the Financial University under the Government of the Russian Federation. However, a catastrophic shortage of personnel, in his opinion, is not yet foreseen: firstly, the so-called hidden unemployment has traditionally been at a high level in Russia.

This is a situation when an employee is formally on the staff of a large company, but in fact is redundant and retains his position, by and large, within the framework of social responsibility. Now, with the departure of Western companies, hidden unemployment should have increased even more, he believes: many organizations have suspended production, but have not made cuts. This talent pool will help fill the gap where it really exists.

Mobilization affected the labor market not only as a factor that caused another wave of relocation, added Elena Varshavskaya, Professor of the Department of Organizational Behavior and Human Resource Management at the Higher School of Business at the Higher School of Economics. In her opinion, many unemployed, especially in poor regions, could join the army both on conscription as part of partial mobilization, and as volunteers. The economic incentive for this is very strong: the amount of 195,000 rubles, which is offered to privates as a monthly salary, for many regions is the average earnings of one person for 7-8 months (Lipsits, 2022).

Personnel shortage at the moment will be most pronounced in the rapidly growing military-industrial sector. In 2023, the military-industrial complex will lack about 50,000 specialists: at

first glance, this figure does not look particularly frightening, but it should be borne in mind that we are talking primarily about highly qualified engineers of a very specific profile - the military industry can respond to their lack by a significant slowdown in growth.

If we talk about more mass professions, then the construction industry, agriculture and IT will face a shortage of labor, he adds. The shortage of workers in the Russian IT industry is greatly exaggerated: even if we rely on Chernyshenko’s July estimate, according to which the Russian IT market lacks about 1 million specialists, it turns out that on average there should be two IT specialists for every 100 workers in Russia, which is a lot with the current structure of the labor market, the expert believes. It would be more realistic to assume that the IT industry lacks about 250,000 specialists - this was approximately the same as the deficit in 2019–2020, when the Russian information infrastructure had to adapt to the pandemic, the economy will probably lack the same number of IT specialists in 2023 (Yeghiazaryan, 2021).

The Ministry of Construction also overestimated the shortage of personnel, which in December announced a shortage of 3 million workers in the construction industry: given the fact that a reduction in housing construction is expected this year, this figure is likely to remain around 150,000 people, Safonov believes. Agriculture will be short of about 100,000 workers, he adds.

A truly effective way to combat staff shortages is to improve technology along with a reduction in the share of manual labor, the expert is sure. For example, in the same construction it may be the purchase of machines for painting surfaces to replace manual painting.

In the absence of new challenges and events that directly affect the working-age population, most likely, in 2023, the unemployment rate will remain at current historical lows, says hh.ru's chief labor market expert, head of client efficiency Natalia Danina.

The fastest increase in the number of vacancies throughout 2022, according to the service, was noted in such areas as installation and maintenance of equipment (60%), construction and real estate (49%), sports clubs, fitness, beauty salons (36%) , extraction of raw materials (33%), working personnel (25%) (Yeghiazaryan, 2021).

In her opinion, of all the listed areas, the demand for personnel will decrease in the extraction of raw materials and construction due to a slowdown in development and a drop in real estate sales. Demand for equipment installers and service technicians will continue to rise in 2023 amid supply constraints, extended lifespans and strain on current production facilities, the expert adds.

3. Forecasts for the Future Development of the Labor Market

Given the current situation on the labor market, the expectations of specialists from employers are also changing. Here are the most important factors for employees:

wages - the choice of the employer depends on its size;

safety and flexibility of working conditions - for most, a safe workplace, flexible working hours and the ability to work in different places are important;

work-life balance - work-life balance imbalance and burnout will be the primary reason for dismissal for 35% of respondents, and 94% equally value salary and work-life balance when choosing a job (Yeghiazaryan, 2021);

creating a DEI environment in the company - adherence to the policy of diversity, equality and inclusiveness is most important for buzzers;

corporate training - most employees are dissatisfied with the quality of internal training, believing that it does not allow them to remain competitive in the labor market and does not contribute to their career growth.

Technology adoption will remain a key driver of business transformation in 2023-2027

More than 85% of companies surveyed cite rising adoption of advanced technologies and increased digital access as trends most likely to transform their organizations. Greater application of environmental, social and governance (ESG) standards will also have a significant impact.

Among other major trends influencing business transformation, companies note:

macroeconomic: rising cost of living and slowing economic growth;

the impact of investment to stimulate the transition to a green economy;

lack of supply (supply);

consumer expectations regarding social and environmental issues.

Environmental, technological and economic trends have the greatest impact on job creation and job loss

Job creation will be heavily influenced by investments to shift businesses to green technology, more widespread use of ESG standards, and localization of supply chains. At the same time, in each case, the growth of jobs will be offset by their partial replacement.

Other significant drivers of job creation include climate change adaptation and the demographic dividend in developing and emerging economies.

5. Conclusion

To conclude, despite the end of partial mobilization, it will still have an impact on the labor market in 2023-2024. Some strong specialists have moved abroad permanently, some companies have opened temporary positions to replace specialists who are subject to conscription, or, if possible, to keep their current jobs. Some employers in some areas have become more flexible to the needs of candidates, offering them more formats of work, incl. alternative options, more opportunities for employees of different age categories and social groups.

Most likely, labor market trends in 2022 will be relevant throughout 2023 and even, possibly, be prolonged into 2024. Most likely, the market (at least in the next six months or a year) will follow the path of localization. Of course, there will be some joint ventures with foreign representative offices, but these will be rather exceptions to the rules. Of course, we are not talking about European countries, but the countries of the Middle East and the Asian region. The following changes are also expected:

The entry of Russian companies into the Asian market and the markets of the CIS countries, which in terms of hiring means the demand for employees with relevant work experience, who speak the relevant languages, etc.

The reverse process is an increase in the share of companies from the Asian region (mainly China, India, Korea) in the Russian market, an increase in the number of new jobs

Import substitution, greater demand for specialists in production areas and public sector employees

The growing popularity of the IT sector, including in state corporations and companies with state participation, etc.

The greatest demand for employees is expected in the areas of the agro-industrial complex, production and operations, finance, quality, jurisprudence, etc.

In connection with the continuation of the special military operation, specialists with experience in the defense industry and cybersecurity will be in demand. Restarting the food and beverage industry will also require a huge amount of labor.

Employers will give preference to stronger applicants with experience and knowledge.

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Patterns and Trends of Informality in Türkiye

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Abstract

This paper uses microdata from the 2015-2018 Income and Living Conditions Survey to examine the patterns and trends of informality in the Turkish labor market. The research considers two definitions of informality based on employment in the informal sector and informal employment. The evidence suggests that labor informality is highly heterogeneous with the two definitions producing disparate rates of informality. However, both definitions of informality showed that informality is substantial in Türkiye, although on a declining trend. Unsurprisingly, we found that female workers, and the elderly (workers aged 45 and older), are disproportionately involved in informal labor activities. The findings also illustrate the importance of education for decreasing informality, with the analysis showing that Illiterate, and low-educated workers depend almost entirely on informal labor. The study concludes by providing recommendations for a better operational definition and analysis of the concept of informality in the Turkish labor market.

Keywords: informal sector; informal employment; labor market; Türkiye

JEL Classification: J21, J46, O17

1. Introduction

The issue of informality is attracting a lot of attention in the literature in both developed and developing countries. While the size of the informal sector has steadily decreased over the past few decades, a large share of global economic production remains undeclared, unregulated, and untaxed. Meanwhile, job insecurity persists worldwide as more than half of the international labor force works without any social protection or a labor contract (Bonnet et al., 2019). Although research on informality has grown significantly in the past decades, there are conflicting theories about the origins of informality, and no consensus exists in the research community regarding the definition and measurements of informality as well.

Regarding Türkiye, while decades of market-oriented reforms accelerated economic development, a large part of economic activities remain informal. Recent econometrics studies showed that Türkiye has one of the largest informal sectors among European countries and most of the country’s labor force works in small informal firms (OECD, 2021). However, a preliminary review of the literature on informality in the country shows that the estimation of labor informality varies substantially across studies. For example, using data from the Income and Labor Condition Survey (ILCS) data, Kan & Tansel (2014) estimated that 46 % of the labor force in Türkiye was informal based on the social security definition of informality. These statistics increased to 57 % while using the enterprise definition of informality based on the characteristics of the firms. Using microdata from the Household Labor Force Survey (HLFS), Bagir et al. (2021) indicated that the share of informal employment to total employment in Türkiye declined from 50% to around 30% between 2004 and 2018. The authors also showed that the incidence of informality was highest among small-sized firms (firms with fewer than 10 workers). A similar study using data from 2000, 2006, and 2012 HLFS by Başlevent &

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Ayşenur (2015) found that the proportion of workers without social security protection has declined from 29 % in 2000 to 25 % in 2012.

This paper contributes to the literature on informality in Türkiye by analyzing the main trends and patterns of informality in the country using alternative definitions of informality. More specifically, we consider the two concepts of labor informality, employment in the informal sector and informal employment during our analysis. This research used microdata from the Income and Living Condition survey covering the years 2015-2018 to examine the dynamics of labor informality in Türkiye.

The rest of the research is organized as follows: The next section reviews the concepts and definitions of informality in literature. The third section introduces our definitions of labor informality. Section four covers the data and the methodology. Section five examines the patterns and trends of informality in the Turkish labor market, for the various definitions of informality. The last section concludes and provides policy recommendations.

2. Review of the Concepts and Definitions of Informality

More than 5 decades after the term “informal sector” was first used by Hart (1973), disagreements about the origins and definitions of informality persist among scholars. Informality is often perceived differently by scholars, policymakers, and international organizations. The first statistical definition of informality was finally agreed upon at the 15th International Conference of Labour Statisticians (ICLS) held in Geneva in 1993 (ILO, 2015). Informality was then defined based on the characteristics of the production units where the economic activities occurred. The production definition of informality focused on enterprises by defining the informal sector depending on the characteristics of the firms. The definition of informality was later revised at the 17th ICLS in December 2003, and the term “informal employment” was introduced to refer to all informal jobs occurring inside both formal and informal sector markets. These two concepts and definitions of informality are explored more thoroughly in the following sections.

2.1. Employment in the Informal Sector

Identifying employment in the informal sector first requires a definition of the concept of the informal sector. The ILO defines the informal sector based on the characteristics of the production units operating informally. These economic units typically have a “low level of organization, and there is little division between labor and capital as factors of production” (OECD & ILO, 2019, p. 155).

The concept of the informal sector is complex and difficult to identify in practice. As such, the ILO uses a step-by-step residual approach to operationally define the informal sector (ILO, 2019). The method centers around the concept of a household market enterprise, and the definition of what constitutes an informal market enterprise follows the following methodology. First of all, a set of criteria is used to identify if the business is a household market enterprise (e.g., is the institution a government unit or a non-profit organization, if the institution is different from an incorporated business unit, keeps accounting records, and sell its products to the market). After the institution has been identified as a household market enterprise, then two criteria are used to decide on the informality status of the business. A household market enterprise that (1) is not registered with the legal authorities for conducting business and/or (2) has a number of employees (including the owners) below a specific threshold is considered to be operating informally.

Employment in the informal sector, therefore, corresponds to any type of job (employers, employees, own-account workers, and unpaid family members) that are working inside informal production units. In practice, countries use various sets of criteria to define the

informal sector and employment in the informal sector. For example, surveys data compiled by the sector ILO for the year 2018 indicated that: (a) registration, (b) institutional sector, (c) size of the enterprise, and (d) bookkeeping are the most popular criteria used by countries for defining the informal sector (ILO, 2019). Meanwhile, the ILO recommends giving priority to registration status over the size of the structure for deciding on the informality status of a household market enterprise. However, the SILC microdata does not provide data about the registration status of enterprises, nor does it give information about the availability of bookkeeping records. The only available information pertains to the size of the enterprise (number of workers); hence this will be the main criteria used to identify employees in the informal sector. Based on the definition of employment in the informal sector

2.2. Informal Employment

Table 1: Operational definition of informal employment by job type

Job Type	Informal employment	Popular criteria for defining informal employment
Employers	<ul style="list-style-type: none"> • Informality status depends on whether: (a) their enterprise is informal, and (b) the enterprise sells goods to the market. • Employers working in informal enterprises are considered to be informally employed. 	<ul style="list-style-type: none"> • Registration of the enterprise • Size of the enterprise • Bookkeeping
Own-account workers	<ul style="list-style-type: none"> • Produce goods and services not for personal use. • Own-account workers whose enterprises belong to the informal sector are considered to be informally employed. 	<ul style="list-style-type: none"> • Registration of the enterprise • Size of the enterprise • Bookkeeping
Unpaid family workers	<ul style="list-style-type: none"> • Unpaid family workers are considered to work informally regardless of the type of enterprise employing them 	Not applicable
Employees	<ul style="list-style-type: none"> • Depends on the status of the job. • Employees are in informal employment if “their employment relationship is, in law or practice, not subject to national labor legislation...” (ILO, 2019) 	<ul style="list-style-type: none"> • Social security insurance³ • Job contract • Paid annual leave. • Paid sick leave.

Source: Authors’ compilation based on information from (ILO, 2019)

Informal employment comprises all types of informal jobs occurring in the labor market (ILO, 2019). The concept of informal employment is broader as it includes labor informality occurring outside the informal sector. The concept of informal employment is defined based on the characteristics of the work that is being undertaken inside the production unit. At the operational level, the definition of informal employment varies depending on the type of job. Based on the information in Table 1, we can say that employers and own-account workers are in informal employment if their enterprises operate in the informal sector. Unpaid family workers are considered to be holding informal jobs independently of the characteristics of the production unit employing them. In the case of employees, the issue of whether they are informally employed or not depends solely on the characteristics of the jobs undertaken and the nature of the relationship between the job and the production units providing the jobs. Thus, employees

³ A universal social security scheme cannot be used as a criterion to define the informality status of a job since benefitting from universal social security is not linked to having a job. Also, the social security contributions should be mandated by law and not voluntarily for social security to be used for defining that a job is informal.

lacking social security insurance for instance are considered to be informally employed regardless of whether they work in a formal enterprise or an informal enterprise (see Table 1).

3. Defining Labor Informality

In the previous section, we reviewed the concepts, and criteria used for defining employment in the informal sector and informal employment. Table 2 summarizes the different components of employment in the informal sector and informal employment. Using this information, we derive two definitions of informality for examining the patterns and trends of informality in Türkiye.

Table 2: Definitions of employment in the informal sector and informal employment based on the types of jobs.

Production unit by type	Jobs by Status in Employment						
	Employers		Own-account workers		Unpaid family workers	Employees	
	Informal	Formal	Informal	Formal	Informal	Informal	formal
Formal sector enterprises					1	2	
Informal sector enterprises	3		4		5	6	7

Source: ILO (2015)

Notes: Cells 3 to 7 refers to employment in the formal sector

Cells 1 and 2 correspond to informal employment outside the informal sector.

Cells 1 to 6 refer to informal employment which corresponds to all informal jobs.

The greys areas represent formal employment, while the cross corresponds to impossible jobs and production units' combinations.

3.1 Defining Employment in the Informal Sector (Definition A)

Based on Table 2, numbers 3, 4, 5, and 6 correspond to employment in the informal sector. We omit employers from our analysis, because of their sample size. In the case of employees, all those that are working in small-sized firms with fewer than 10 workers are considered to be employed in the informal sector. The analysis is straightforward for unpaid family members since they are considered to be working in the informal sector independently of the firm employing them. The case of own-account workers is tricky because there is no detail about the registration status of their business in the SILC survey. We cannot also disregard them because they account for 15 % of all types of jobs. Moreover, using the size criteria with this group might produce misleading results because own-account workers usually operate their business alone, whether the business is legally registered or not. To deal with this issue, we follow the approach of Gasparini & Tornarolli (2007), and we link the informality status of own-account workers to the levels of their skills. Skilled own-account workers are considered to be operating formal enterprises whereas unskilled own-account workers are assumed to work in informal enterprises. This setting is in line with the informal sector definition of the ILO, which regards the sector as comprising economic units that rely on unskilled labor and with limited production capabilities. We followed the ILO (2007) skillset guidelines and defined unskilled own-account workers as those whose highest level of education is high school education (skills levels 1 and 2). In contrast, skilled own-account workers are those who have a tertiary education degree or certificate (Skill levels 3 and 4).

Employment in the informal sector will be defined as follows:

Definition A: A person belonging to any of the following categories is considered to be working in the informal sector: the individual is (i) an unskilled own-account worker, (ii) a salaried worker in a small firm, or (iii) an unpaid family worker.

3.2 Defining Informal Employment (Definition B)

Informal employment includes all types of informal jobs occurring inside a labor market (informal and formal). Based on Table 2, we know that social security represents the main criteria used for defining informal employment. We also apply a similar definition for our second definition of this study, based on the characteristics of the jobs.

Definition B. An individual working in a job without social security insurance is considered to be in informal employment irrespective of the legal status of the enterprise providing the job.

4. Data and Method

This section covers the data and methodology used for examining the patterns and trends of informality in Türkiye for the two definitions of informality.

4.1 Data Source and Description

This research used microdata from the 2015-2018 waves of the Income and Living Conditions survey. The data was collected by the Turkish Statistical Institute (TURKSTAT). The SILC design follows a two-stage stratified cluster sampling method without substitution. Our sample focuses on working individuals aged between 15 and 64 years old inclusive. This gives us a dataset of around 102 153 people overall, with 25 718 individuals for the year 2015, 25 094 for the year 2016, 25 062 for the year 2017, and 26 279 for the year 2018.

Table 3: Proportion and type of work for the period 2015-2018

Employment status (%)	2015	2016	2017	2018
Employees	71.1	72.4	72.8	72.9
Employer	4.3	4.3	4.3	4
Own-account workers	14.7	14.3	14.3	14.4
Unpaid family workers	9.9	9.1	8.7	8.7

Source: Authors' estimations based on SILC 2015-2018

Table 3 shows that employees (permanent and casual) constitute the main type of employment status in the sample. The proportion of employees in the total exceeds 70% in any given year, with the percentage rising slightly over the years. The second most important group of work types is own-account workers who make up about 14 % of total employment each year. Unpaid family workers average 9 % of total employment in the sample, and employer at around 4 % represents the smallest group.

4.2 Method

We use descriptive analysis to examine the patterns, and trends of employment in the informal sector and informal employment in Türkiye based on the SILC 2015-2018 data.

5. Descriptive Analysis of Labor Informality in Türkiye

Although previous research has shown that informality has been steadily decreasing in the past few years, the rates of informality in Türkiye remain high. substantial. Statistics in Tables 4, 5, and 6 produce some interesting results. First of all, labor informality in Türkiye is substantially independent of the definition of informality used. The rates of labor informality in the country

vary between 45 and 49 % for Definition A and between 30 and 32 % for Definition B. Statistics on both definitions show that labor informality has been slightly declining in the period 2015-2018.

Moreover, we see that the rates of informality are higher among working females relative to working males considering both definitions of informality. Elsewhere, the 55-64 years old group presents the highest share of informality, whereas the 25-34 years old group has the lowest rate of informality in the sample. Education seems to be inversely linked to informal labor participation. Illiterate workers without formal education are disproportionately represented in the informal labor market. For example, the rates of informality for illiterate workers over the entire period average 68 % using Definition A and 86 % using Definition B. In contrast, these statistics are 37%, and 15 % respectively for workers with high school degrees.

Table 4: Informality rates by definition type and gender for the period 2015-2018

Share of informality (%)	2015	2016	2017	2018
<i>Global sample</i>				
Definition A	49	46.4	45.8	45.6
Definition B	32	32	30.3	30.1
<i>Female sample</i>				
Definition A	54.8	51.4	50	50.3
Definition B	45.1	41	39.2	40.1
<i>Male sample</i>				
Definition A	46.5	44.2	44	43.6
Definition B	26.3	25.7	26.3	25.7

Source: Authors' estimations based on SILC 2015-2018

Notes: Definition A corresponds to employment in the informal sector while Definition B refers to informal employment.

Table 5: Informality rates by definition type and age group for the period 2015-2018

Share of informality (%)	2015	2016	2017	2018
<i>15-24 years old</i>				
Definition A	52.2	48.3	48.1	48.6
Definition B	39.3	34.7	35.1	34.8
<i>25-34 years old</i>				
Definition A	39.7	37.2	35.1	35.2
Definition B	20	18.6	17.5	17.7
<i>35-44 years old</i>				
Definition A	47.2	44.4	44	42.8
Definition B	25.8	23.5	23.4	22.7
<i>45-54 years old</i>				
Definition A	55.4	53.2	53.3	52.6

Definition B	41.2	40.2	38.6	37.8
55-64 years old				
Definition A	71.6	67.2	66.6	67.2
Definition B	67.7	66.5	68.2	68.4

Source: Source: Authors' estimations based on SILC 2015-2018

Table 6: Informality rates by definition type and education for the period 2015-2018

Share of informality (%)	2015	2016	2017	2018
<i>Illiterate</i>				
Definition A	71.6	68	67.6	66.4
Definition B	87.5	84.9	86.4	85
<i>Not a graduate⁴</i>				
Definition A	73.9	71.9	69.5	70
Definition B	68.2	66.7	64.7	64
<i>Primary education</i>				
Definition A	61.3	61.4	60.8	61
Definition B	43.2	44.1	43.1	43.2
<i>Secondary education</i>				
Definition A	43.4	54	53	52.8
Definition B	18.7	32.2	34.9	36.3
<i>High school</i>				
Definition A	26	40	40.4	41.3
Definition B	8.3	16.5	17.8	17.7
<i>Higher education</i>				
Definition A	NA	16.4	16.5	15.8
Definition B	NA	5.1	5.8	6

Source: Source: Authors' estimations based on SILC 2015-2018

6. Conclusion

This paper defined and analyzed informality in Turkish labor considering the characteristics of production units and jobs in the informal economy. We used the 2015-2018 SILC data to construct two definitions of labor informality for Türkiye, denoted Definition A, and B. Definition A, which captures the concept of employment in the informal sector is obtained by focusing on own-account unskilled workers, employees in small-sized firms and unpaid family workers. Definition B on the other hand is linked to the concept of informal employment, and we use the lack of social security assurance as a criterion for the operation definition of informality.

Our analysis showed that the two definitions produce different rates of informality for the Turkish labor market. According to Definition A, employment in the informal sector fluctuated between 45 and 49 % over the study period. Meanwhile, Definition B indicated that Turkish

⁴ Literate but did not attend and graduate from school.

informality rates vary between 30 and 32 % in the years 2015-2018. Moreover, the analysis shows that both definitions of informality exhibited a downward trend from 2015 to 2018. Our findings are also in line with theoretical expectations. We found that informality was higher among female workers compared to male workers and that uneducated, and elderly workers were almost entirely relying on the informal labor market. It is also clear that increasing access to education is critical for decreasing the prominence of informality inside the Turkish labor market.

In sum, this study presented a snapshot of informality for the labor market in Türkiye using two different definitions of informality. However, the research has been impacted by data issues. More specifically, the criteria for defining the informal sector and employment in the informal sector are limited. As of now, the only criteria used for the operational definition of the informal sector is the size of the enterprise. Unfortunately, this criterion is often not useful when dealing with own-account workers, for example, who often operate their business alone. Collecting information about the registration status of enterprises, and the availability of accounting books for instance can increase the number of criteria used for identifying the informal sector.

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An Empirical Check-Up Approach Using Data Analytics for Sustainability in Micro, Small and Medium-Sized Enterprises

Mehmet Nuri İnel¹

Abstract

The effects and importance of sustainability are felt more and more every day. Companies that want to take part in the global supply chain need to go a long way in terms of sustainability. It is obvious that micro, small and medium-sized companies have a large share in the global market. It is difficult to collect the sustainability data required in GRI SASB etc. standards especially for micro and small businesses. The second step that is after collection sustainability data needs analysing to develop strategy and tactics for decision makers. In this study, the aim is to provide suggestions for global micro, small and medium-sized companies to check-up their sustainability status about using data and analytics

Keywords: Sme, Sustainability

1. Introduction

The effects and importance of sustainability are felt more and more every day. Companies that want to take part in the global supply chain need to go a long way in terms of sustainability. When it comes to sustainability in SMEs, it is a difficult process. Both adapting to standards and applying them effectively are a few of the problems. Complying with the Sustainability standards need both knowledge and skill of applying. Basically data gathering is needed for sustainability. Big companies have their capability and skills to collect data. In fact, they can afford to establish separate departments for sustainability.

There are lots of studies that focus on sustainability and sustainability for SMEs. But in practice awareness and solutions are needed that are simple to execute for SMEs. Most of studies focus on small and medium companies but fail to adress micro companies.

Firstly, literature regarding the sustainability for companies and SMEs is reviewed. The importance of SMEs also is mentioned. Third part is dedicated to digitalization for SMEs. Because digital solutions may be easy to use for collecting data and analysing for sustainability. The fourth topic is data analytics for sustainability especially in SMEs. In these topics sustainability reporting also is focused in literature review. After literature review a check-up approach is suggested for sustainability in SMEs.

2. Literature Review

A basic way to integrate sustainability to companies is presented in Figure 1. Integrating sustainability to corporate operations is important too. (Borsa Istanbul Rehberi 2020) Basically integrating sustainability process can be summarized in three steps. At first, companies should determine sustainability development goals that they want to reach. They also determine sub-goals that suits them. Collecting data is an another important step for them because companies need data and data analytics for both checking the situation and improvement needs. Last step is reporting, integrating and applying. It also contains improvement actions in terms of results.

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Figure 1: Sustainability Implementation Process Example

Source: Borsa Istanbul Rehberi 2020

Creating sustainability strategy is an important issue for each companies. It needs data in each step. Micro, small and medium-sized companies can benefit from them. Strategic planning process needs data. Basically data can be used for sustainability reporting that is expected by the authorities and decision makers. Data and analytics issues are studied by many researchers.

When we define SMEs according to EU: micro: less than 10 persons employed, small: 10-49 persons employed medium-sized enterprises: 50-249 persons employed. (Eurostat)

It is estimated that there are approximately 332.99 million SMEs worldwide in 2021, slightly more than in 2019 when there were 328.5 million. The number of SMEs in the most recent year was the highest in the provided time period. We can see the numbers in Figure 2. (Statista)

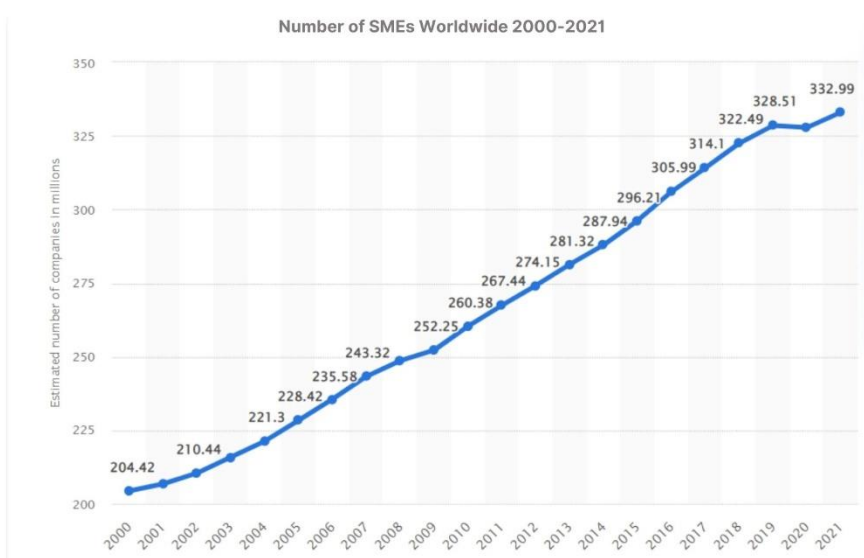


Figure 2. The approximate number of SMEs in the world in 2021

Source: (Statista)

Employment creation, fast adaptation, flexibility feature; encouraging entrepreneurship; product differentiation; working as sub-industry are some of the contributions of SMEs to the economy (Erđin, Özkaya 2020)

Arena and Azzone (2012) asserted key sustainability indicators to support small and medium sized enterprises in initiating sustainability reporting (Arena M, Azzone G. 2012). Another study also asserted an approach to support decision-makers in SMEs and prioritize sustainability reporting standards. They proposed a multi criteria decision method approach to prioritize sustainability reporting standards (Gutierrez P. R et al 2021).

There are many studies that focus on areas (innovation, reporting, examining measurement of sustainability etc.) that deal with sustainability of SMEs (Bos-Brouwers H E J 2010) (Martinez E O et al 2020) (Prabawani B 2013).

Developing sustainability reporting especially in social and environmental issues for SME is an important issue (Martins A et al. 2022).

There is a study that compares consultants and academic perceptions regarding sustainability reporting in SMEs (Polo C F and Guerrero-Baena MD 2023).

A study examined the relation between sustainability and SME performance. (Kautonen T. et al. 2020) Another study examined association between innovation, sustainability and its impact in SMEs (Chege M.S., Wang D. 2020)

Traveso M. et al suggested a dashboard that shows assessing the sustainability performance of products. This dashboard has integration with life cycle sustainability assessment (Traveso M. et al 2012).

Briefly, there are important points for SMEs according to Worldbank (Worldbank 2023):

- SMEs (Small and Medium-sized Enterprises) generally make up around 90% or more of all businesses in most countries.
- In the European Union, SMEs represent about 99% of all businesses and provide two-thirds of private sector employment.
- In the United States, SMEs make up approximately 99.7% of all businesses and employ about 47.3% of the private workforce.
- In developing countries, SMEs represent a significant portion of the economy and often contribute to more than 50% of total employment and GDP.
- There are approximately 400 million small businesses worldwide.
- 600 million jobs will be needed by 2030 to absorb the increasing global workforce, making SME development a high priority for many governments around the world.

2.1. Data Analytics for Sustainability

There are lots of studies focusing on data analytics for sustainability. A study about usage of business analytics to corporate sustainability analysis tells sentiment analysis-based method, its benefits and superiorities. (Wen J. 2014)

There are many studies that indicated usage of big data for sustainability into different aspects (application, analysis, organization of unstructured data etc). (Kumar Etal 2021) (Barnes S.J. et al 2022) (Lv Z. 2018) One of them indicated smart grid (Ponnusamy V.K et al 2021)

A study investigated big data analytics for SME by using a focus group. (Falahat M. et al 2022). Another study is about usage of big data for supply chain sustainability and is about predictive analysis. (Hazen BT et al 2016)

Business analytics and sustainability was told in a study by asking questions to clarify relationship between them. (Tal A.S 2022)

Predicting financial sustainability is one of topic that business analytics used. (Kim K et al. 2018)

Data collection is also another important issue for sustainability.. Data collection is another problem especially micro and small companies. There are different approaches about collection data via network especially in Europe. But most companies don't use these data collection

networks. This network is for farms. There are advantages and disadvantages according to study. (Vroljck H et al. 2016)

Data mining for sustainability is another different topic. For example, sensor technologies need analysing data. Like scalability, integration, distributed data mining, real-time prediction, understandability topics are important challenges. (Morik K. et al 2012)

There is a study that uses numbers for sustainability and lifecycle analyses among countries. (Ramakrishna1 S. et al 2022) Different aspects of sustainability analytics are exemplified in a study (Choi TM et al. 2022)

Wu P. J. examined the environmental sustainability in logistics systems through big data analytics. (Wu P. J. 2016)

There is a study that named sustainability check-up which focus on methodology multi-attributive assessment of clean development mechanism in the literature. (Sutter, C. 2003)

There is a study that develops sustainability practices framework with using multi criteria decision making methods for Micro, small and medium-sized enterprises (Jamwal A et al. 2021)

2.2 Sustainability Reporting for SMEs

There are many studies for sustainability reporting especially for SMEs. A study evaluating the effect of psychological factors of business owner-managers on sustainability reporting in SMEs and how they communicate their operations through various channels was found in the literature. (O. Acheampong et al. 2022)

A study examines the effects mandatory sustainability reporting (Bergmann A. and Posch P. 2018) The adoption process of sustainability reporting in small and medium-sized enterprises (SMEs) is examined too. (Massa L et al. 2015)

Cankaya F and Sahin Z investigated the reasons why SMEs cannot achieve sustainability by examining the reports (Cankaya F and Sahin Z 2018)

Borge F et al aimed to explore the importance of sustainability principles and corporate social responsibility for SMEs and to assess the potential of sustainability reporting as a tool to engage stakeholders. (Borge F et al 2009)

Another study examined sustainability reporting practices in German small and medium-sized manufacturing enterprises, focusing on the implementation of the Global Reporting Initiative (GRI) framework. (Steinhoff E et al 2019)

Rossi and Vilchez examined the process that sustainability is integrated into practices of accounting. The results indicated different factors and organizational dynamics contribute to sustainability reporting and diffusion of sustainability practices in SMEs. (Rossi A, Vilchez M L. 2020)

Shields, and Shelleman examined the importance and advantages of sustainability dashboards in SMEs. Sustainability dashboards can use both making decision and reporting. (Shields, J. F., & Shelleman J. M. 2020)

Given their limited staff and financial resources, preparing a sustainability report can be challenging for SMEs. Shields, J. F., and Shelleman J. M. proposed the use of "Impact Assessment", a framework developed for SMEs to structure their approach to sustainability. (Shields, J. F., & Shelleman, J. M. 2017)

Corporate sustainability can be managed with management information systems (Caldelli A and Parmigiani M.L 2004) There are some limitations, but also advantages using MIS for sustainability. (Nowduri S. and Al Dorassy S 2012) MIS solutions are costly, needed expertise,

difficulty adapted in some scenarios, may be difficult to develop for some organizations (Nowduri S. and Al Dorassy S 2012)

2.3 Digital Transformation in SMEs

Digitization or digital transformation is another issue that is examined together with sustainability. (Zoric N. et al. 2023) (Wut T.M. et al 2021) (Mere J.O. et al. 2020) The digital transition is another issue that is examined together with sustainability. (Rosario A.T. et al. 2022) Digitalization and sustainability together are the drivers of great change. (Thiede S. 2021)

The UNEP focuses on accelerating, scaling sustainability by applying data, digital solutions and technologies In figure 3 part of the sub-programme is shown. (The UNEP 2023)

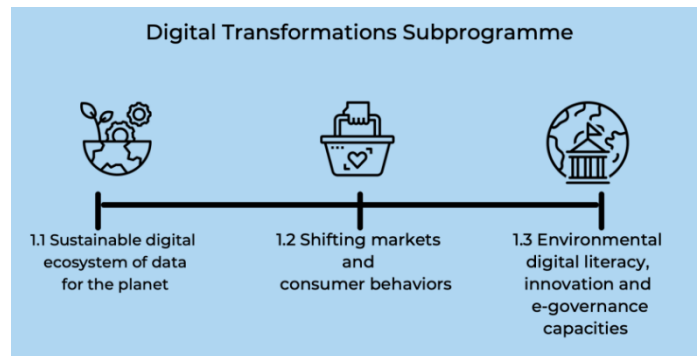


Figure 3: Digital Transformation Subprogramme

Source: The UNEP

Digitalization is another important issue for the SMEs. In fact, Covid 19 accelerated the process. As can be seen in Figure 4 diffusion rates are not the same for each aspect. It shows us there may be lots of improvement areas. According to this study, there are some barriers that affect the digitalization of SMEs. Some of them are internet skill gap, financial gap, infrastructure gap. (OECD (2021) The Digital Transformation of SMEs)

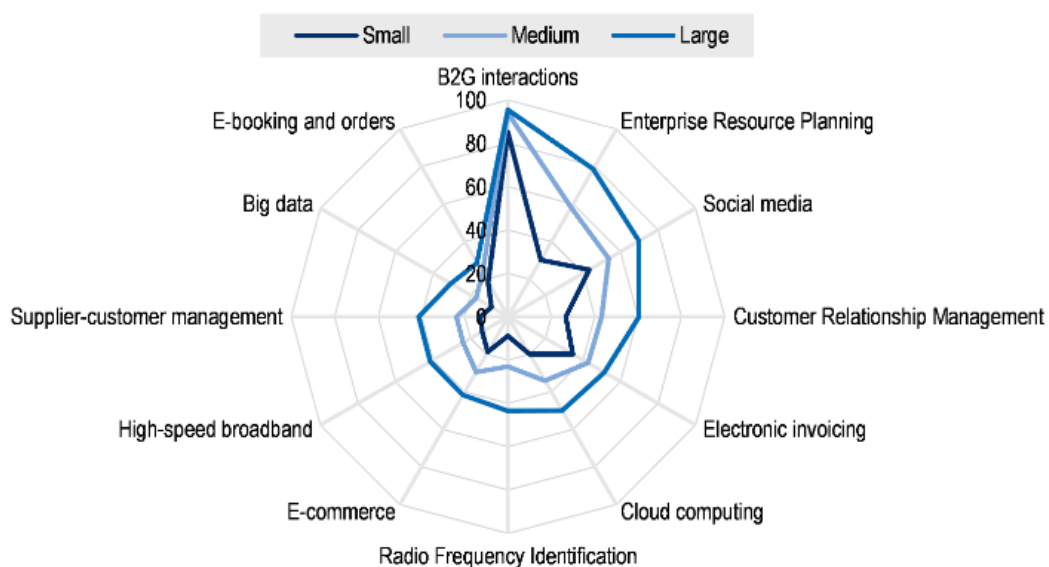


Figure 4: Digital Adaption in SMEs

Source: OECD (2021) The Digital Transformation of SMEs

3. Empirical Approach

According to European Council Council of the European Union SME has rules on sustainability reporting. The rules should be applied on corporate sustainability reporting until January 1st 2016 for listed SMEs. (European Council Council of the European Union, 2022) In this point, MSMEs aren't big companies, sustainability consulting is expensive for them, understanding of sustainability standards are difficult for entrepreneurs that aren't interested in, they will have to conform sustainability standards.

First suggestion may be a digital based solution. It can be useful for users and decision makers. In the literature review digitalization and sustainability issues were examined.

Management information systems (MIS) can be also a solution. Corporate sustainability can be managed with management information systems (Caldelli A and Parmigiani M.L 2004) There are limitations and advantages using MIS for sustainability. But It is a difficult to have a MIS especially for micro and small companies.

Reporting and decision making are important issues for MSMEs. They have to survive in the supply chain in the future. Check-up is required for development in sustainability. Check-up results help to identify sustainability situation of MSMEs. It allows to take precautionary by identifying the risks in advance. It needs to be a software or application that every MSMEs can use easily.

An empirical solution can be suggested. There are four steps.

1- Creation of application or software: It may be internet based. Authorities or organisations or companies can support to build it. MSMEs should access it easily and buy it at very low budgets.

It must be user friendly, accessible, understandable, agile and automatized (as far as it can be)

2- Data collection: Data collection for sustainability is a big problem for companies. GRI, SASB, etc. standards want to see the situations of companies. Standards include two types of data. The first one can be collected automatically. The second one is hard to collect automatically. In this study suggests that converting this data to the questions to collect them by asking understandable questions. Question based data collection is both easy and understandable for employee that hasn't been interested in sustainability yet method.

The questions may also change according to the changing standards. These standards can vary by industry. Questions can be open-ended, multiple choice, or require the input of numerical values. Approximately 1232 question sets have been identified, with 1082 of them being qualitative and 150 being quantitative.

This type of questions can use to collect data according to GRI standards by application for example:

“What is your industry? Please select.

Can you provide information on the size and relative importance of markets? (e.g., net sales, net revenues). Enter values.

What are the geographical locations where your products and services are offered?

What are the demographic or other characteristics of the markets?

What types of suppliers do you have? Please select.

What is the estimated number of suppliers at each level of the supply chain (e.g., first tier, second tier)?”

3- Data analysing: After data collection companies have quantitative and qualitative data. They can be analysed with business analytics methods. Briefly, analytical methods can be categorized as,

- Descriptive Analytics
- Predictive Analytics
- Prescriptive Analytics

Descriptive analytics describes what has happened in the past. It can show the company situation in terms of sustainability. Output of this analytics can help for decision makers regarding to compare before after situations to reach sustainability standards. In fact, it shows the development areas in different aspects.

Predictive analytics, calculates prediction using past data to predict the future or determine the effect of one variable on another. (For example: time series analysis & forecasting, simulation, data mining) As data accumulates, sustainability indicators can be predict for the future. It presents a vision for the future. Sustainability simulations can be applied for company

Prescriptive analytics indicates a best alternative or number for example optimization models, decision analysis, simulation (Camm J et al. 2015)

4- Check-up the situation and reporting:

In each time period, system can check-up corporate sustainability situation. It can,

- Compare before – after values of indicators to improve standards
- Determine the risky points, by examining irregular transactions
- Forecast quantitative variables for the future
- Simulate indicators for example: if-then rule based

The empirical process is shown in figure 5th. Check-up the situation step is development step according to check up result for companies. Decision makers can take action. This approach also helps to report sustainability situation. It is a easy way to write a report.

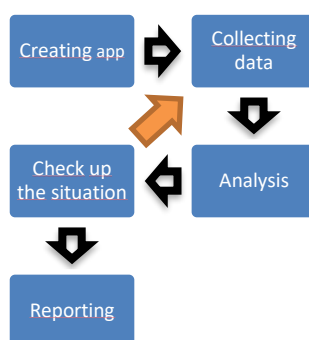


Figure 5: Empirical Approach Steps

4. Conclusion

As a conclusion this study aimed at showing the importance for micro small medium-sized companies for sustainability and suggesting data collection-based check-up approach via software. MSMEs can survive in the changing conditions and be ready for sustainability reporting. They can adapt to the environment and monitor their situation (advantages and disadvantages). Also they can control themselves by using data analytics. They can easily collect sustainability data and report sustainability according to sustainability standards.

The software solution has to become cheap, accessible and understandable. Although there is less study in the literature, this study also points to the sustainability need of micro enterprises.

For further research, each step of this approach can be detailed. Different methods can be suggested and applied. If a software is developed, user experience can be measured and tested.

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Abnormal Stock Returns as a Leading Indicator of Crisis

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Abstract

Defining the main indicators of crisis has always been a relevant topic for investors, policy makers and company management. Large systemic risks are forcing many large firms both permanently and temporarily to leave foreign markets. Such step may entail the future crisis for these companies especially if the firms are dependent on the profit they had been gaining from this market. This study aims to determine the leading crisis indicators using the sample of 185 firms which restricted the investments in one of the foreign branches by April 2022. The reverse event study and the binary probability model - the logistic approach was implemented to achieve the purpose of the study. The results showed that crisis may occur for 97 companies out of 185 ones. Moreover, the Current ratio, Profit Margin, Debt to Equity and ROE turned to be significant indicators of the future crisis forecast for these companies.

Keywords: crisis indicators; event study; binary probability model

1. Introduction

Nowadays the world's past experience demonstrated that crises could entail various unforeseen consequences, and that is why it is important to know in advance whether any significant deviations from the initial equilibrium point in the market are expected. For example, the global financial crises, which occurred in the past years, had an inevitable impact on the world's economy, and significant amount of time was needed to recover (Li and Wang, 2014).

In this article, we analyse how companies' stability and growth changes due to systemic and political risks. We explore the phenomenon on the example of real events that took place in Russia in 2022. For April 2022, there are already hundreds of foreign companies which decided to somehow stop investments in new projects in Russia, reduce imports of some products, or even leave the Russian market at all. This may lead to future deviation from the previous equilibrium point in of a company return, which can cause crisis situation.

The analysis may help investors and policy makers to prevent their possible future losses, use specific financial strategies and facilitate the activation of counter-policies on time to avoid all the risks (Bluwstein et al., 2021). Such methods are generally called the financial early warning (FEW) models and include various binary probability models, machine learning techniques and others. They allow to estimate not only how massive and widespread the crisis would be, but the approximate time of its beginning as well. However, to provide such analysis it is essential to determine specific indicators which played a major role in the specific crisis incidence.

The events which may entail future crisis expansion may include drops in GDP, currency depreciation, a decreasing level of reserves (Kaminsky, 1997) and various internal factors such as financial indicators of the companies. It is also considered that the psychological factor also plays a significant role in the future crisis incidence. Indeed, different investors' behavior patterns may be explained by biases from the behavioral finance study and could lead to significant deviations from the initial equilibrium. All of the indicators mentioned above were

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significant in various prediction research. Moreover, the yield curve slope is also considered to be as one of the leading indicators of an upcoming crisis.

This study aims to contribute to the existing research and tries to determine the leading crisis indicators and specify the significance and relevance of the foreign companies' decision to restrict investments in the Russian market. To achieve the purpose of the paper, the reverse event study analysis is thoroughly analyzed and the binary probability model is implemented. The long-term goal of the study is to provide an extensive and accurate research which will be useful for investors and policy makers in the future. The structure of the paper is as follows: firstly, the literature review is provided, then the data and preliminary analysis are performed. Further, the methodology of the paper and the results are discussed. Finally, the conclusion of the overall analysis is provided.

2. Literature Review

First, we specify the definition of a financial crisis. Mishkin (1992) claim that the crisis is associated with the disruption of financial markets, which entails to the impossibility of funding those who have the most productive investment opportunities. As a result, this leads to the sharp deviation from the initial equilibrium point. Most of the researchers claim that such dramatic deviations may be predicted in advance to be ready to face all of the possible consequences.

Literature provides numerous analyses and reasons which explain the beginning of crisis starting from lax monetary policy and ending with some behavioral aspects of investors. Taylor (2009) states that government actions and interventions were one of the main reasons of crisis worsening. The author claims that frequently monetary excesses led to a boom and inevitable bust in the market and caused the global financial crisis in 2008. Moreover, he states that government intervention in the form of support for some certain financial institutions even made it worse and prolonged the crisis duration. Carmassi et al. (2009) support this opinion and claim that lax monetary policy was the main reason of such massive financial instability. Furthermore, the authors suppose that these faults could have been avoided and conclude that there is no need in complicated rules in securitization, that's why it is better to keep the rules simple. They emphasize that one of the reasons of speculative bubble occurrence is a credit boom in the real estate market. When the house prices went up, the banks encouraged households to take mortgage loans even this was not reasonable. This led to ballooning mortgage loans to very risky borrowers and providing the basis for an even larger inverted pyramid of structured products.

The 2008 financial crisis resulted in increasing interest in better understanding how to provide savvier saving and borrowing behavior. That's why another reason of crisis occurrence is financial literacy. Klapper et al. (2013) suggest that consumer's ability to make informed and rational financial decisions may have an impact on financial stability in both micro and macro levels. Indeed, several studies show that people with high literacy are more likely to manage day-to-day finances, plan for retirement and accumulate wealth which may be extremely useful in certain life circumstances. Gerardi et al. (2010) claim that people with low financial literacy are more likely to have costly mortgages or have some problems with them. Since the global financial crisis had its beginning in the US real estate market and is specifically connected with mortgage loans, it is reasonable to emphasize the importance of financial literacy in mortgages among people. Moreover, Agarwal et al. (2009) state that wrong financial decisions are mostly made by either young or elderly individuals, which is more likely to make up a group of people with low financial education. Taking into account individual's behavior during financial crises, Klapper et al. (2013) state that people with high financial literacy are less likely to experience negative income shock in 2009 and have greater availability of unspent income. They conclude that financial literacy may help people to face unexpected macroeconomic and income shocks

2.1. Indicators of Crisis

To provide a thorough empirical analysis it is important to choose appropriate indicators which would fully represent the reasons of such financial instabilities. Literature provides some quantitative indicators which allows to predict crisis incidence. Alessi and Detken (2009) in the research state that most of the financial crises were preceded by an increase in leverage and assets prices and excessive credit expansion. Increase in leverage is the ratio of debt to equity which indicates a lower capacity to meet different losses. Moreover, the aggregate measure of leverage may be provided by the ratio of debt to GDP. If the rapid increase of such ratios is noticed, then it may be considered as one of reliable predictors of crisis occurrence (Carmassi et al., 2009). Asset price bubble can be expressed as the ratio of house prices to rents which may be one of the crisis indicators as well. These indicators may be considered when analyzing if a company is facing some financial instabilities and is on the verge of upcoming crisis.

There are also some other macroeconomic indicators mentioned in the literature: drops in GDP and industrial production, currency depreciation, stock market performance and the level of reserves. Considering a large variety of such prediction variables, it is also important to notice that there are different leading indicators for different types of crises. For example, the indicators for currency crisis include the real exchange rate, domestic credit, credit to the public sector and domestic inflation (Kaminsky, 1997). However, it may be relevant to consider some other variables as well as they are all correlated. Moreover, it is always necessary to know whether the indicators which performed better in explaining the preceding crises could also explain the next coming ones. Frankel and Saravelos (2012) suggested to choose the most common indicators to assess the usefulness of their prediction power for the next wave of crises. The authors decided to look at the 2008- 09 financial crisis as it was quite well-suited for the analysis because of its huge magnitude and impact on the global economy. They found out that international reserves and exchange rate overvaluation were the most useful and robust to any crisis incidence definitions.

The researchers also paid attention to the yield curve movements and consider it as a crisis predictor as well. It is known that yield curves demonstrate the changes in investors' expectations about the future of the market, and that's why it is possible to understand whether a crisis would occur in 1-2 years. Slope of the yield curve represented by the difference between the short and long term interest rates, may provide information about future values of real GDP growth (Khomu and Aziakpono, 2007). Bluwstein et al. (2021) used machine learning approach to conclude that slopes of yield curves are one of the most important predictors. Sowmya and Prasanna (2018) also considered yield curve movements as important predictors and decided to analyze their interactions with various macroeconomic factors. A bi-directional relationship was found, and the authors state that the policy rate and the inflation rate affect the end of yield curves, and that's why it is possible to organize an effective management of the monetary policy and avoid crisis incidence.

Different financial indicators may be used as early signals of the upcoming crisis of a company. Liang et al. (2016) in their paper used various groups of financial indicators and found out that «Solvency» and «Profitability» variables are significant as the indicators of the future company bankruptcy. The «Solvency» indicators included the current ratio, current assets/total assets, equity to liability and others. As for the «Profitability» indicators, the authors used the Return on Assets (ROA), Gross profit to Net Sales, Retained Earnings to Total assets and others. They also managed to include the corporate governance variables such as board structure, ownership structure, cash flow rights and others and reflected them as the number of boars seats and directors, shareholding ratio of directors and using some other variables as well. Emerling (2014) examined the predictive power of various financial indicators such as the current

liquidity ratio, quick ratio, debt ratio, receivables collection period, inventory turnover, earnings before interest and tax (EBIT). The authors claim that the greatest prognostic value of the company's bankruptcy have been noted for profits (EBIT) and net profit.

2.2. Binary Probability Models and Other Methods of Prediction

There are a large variety of methods for crisis prediction and each of them has its own advantages and disadvantages. Bluwstein et al. (2021) in their research used various methods for prediction: binary logit models and decision trees are among them. Caggiano et al. (2014) analyzed the low income countries and used multinomial logit approach to predict systematic banking crisis. The researchers claim that binomial logit approach could arise the crisis duration bias and is not relevant for the cases where the duration of crises is no longer than one year. Moreover, Caggiano et al. (2016) compared logit based early warning systems for the systematic banking crises. They conclude that multinomial logit model outperforms the binomial one in such prediction analyzes. In addition to the logit models, Cavdar and Aydin (2015) proposed to analyze the data in dynamic and used binary fixed panel logit approach and found some significant results as well. Li and Wang (2014) emphasized the main advantage of using logit model approach for FEW predictions: the method is well-known and the results are easy to interpret. There are also some other methods for crisis prediction mentioned in the literature. Paraskevas and Altinay (2013) proposed to use inductive approach for the research about the tourism crisis after some natural disasters and interviewed 16 executives of tourism companies. This article showed the possibility of implementing the inductive method of research for such topics as well.

Some more complex methods may be used as well: Bluwstein et al. (2021) used some machine learning techniques for the research of crisis incidence prediction and managed to find out that credit growth rate, yield curve movements, GDP and CPI may also be considered as significant crisis indicators. Furthermore, Aydin and Cavdar (2015) proposed to implement the Artificial Neural Networks approach which simulates cognitive learning process of human brain. They used the multi-layered feedforward neural networks and found that this method, if used correctly and appropriately, is quite striking. Despite of this fact, Li and Wang (2014) claim that this method has some shortcomings such as illogical weightings of variables and over fitting in the training set which may result in low predictive accuracy.

The economic and financial consequences of the influence of political risks are quite fully disclosed in the paper of Waszkiewicz (2017).

In opinion of Waszkiewicz (2017), political risk (PR) seems to be narrowed down to micro and macro governance in less developed economies. Of course, they are sources of hazards for developed countries, but the authors state that it is developing countries that are most exposed to political risks (Lensink, Hermes & Muride 2000; Le & Zak 2006). Probably, the scarcity of detailed analysis may explain incomprehension of the subject in developed countries.

PR is broadly defined as a political decisions' influence on economy, which can be stabilizing or destabilizing for the free market (Titman, Kewon & Martin 2011). On the opinion of Titman, Kewon & Martin (2011) and Alon & Herbert (2009) PR in micro ground affects certain projects realized by overseas companies that function in significance areas (energy, natural resources, etc.) for the host economy, but not industries and companies in a same way. Therefore, sometimes political difficulties may create exceptional trade or investing opportunities (Kozłowska 2015). At the same time macro political risks overlaps micro ground because they mostly share the same sources, however, that ground depicts country investment's profile clearly, catching the political as well as instability approaches together.

By April 2022, there are about 300 businesses which restricted their investments in Russia in different ways. This number includes, firstly, those companies which decided not to make radical decisions - they are either withdrawing some certain business operations or even just waiting and planning to act depending on the future circumstances. Such companies consider a possibility to return to the Russian market. Secondly, there are also a number of foreign companies which closed their business in Russia at all. All of these changes may be beneficial for some other companies which try to enter the market.

3. Data and Method

In this study the data analyzed contains the list of companies which have decided to stop their investments in the Russian market partly or at all. The list was collected manually from different news and divided into two main groups:

- The companies which decided to leave the market or stopped selling and services;
- The companies which temporarily stopped their operations and consider the possibility to come back in the market.

The first category includes the list of 68 foreign companies, and the second one - 117. The total number of the firms analyzed in this study is 182. The list was finally collected by April 20, so the companies which left the Russian market after this date were not included in the analysis. Moreover, some foreign firms did not announce about their positions, possibly doubting how this decision may affect the company's performance in the future, so they were not included in the study as well. Furthermore, it is important to notice that there are about 300 foreign companies leaving the Russian market by the middle of April 2022, but the about a half of them are privately owned and do not trade their stocks, so they were not included in the analysis as well.

The preliminary analysis of the data showed that most of the companies that are mentioned in this research are headquartered in the USA: 66,18% from the first list and 47,9% from the second one. There are also a few companies from the United Kingdom, which accounts for 13,24% of all the firms from the first group, and 7,56% from the second group.

It is seen that some foreign firms are only included to the second list, which means that these companies consider the possibility to return. Such companies include firms from Denmark, Australia, and Mexico. What is more, such a huge exporter of different electronics and autos (12 firms) like Japan also decided not to make radical decisions and consider the return to the Russian market as well. None of the Japanese firms decided to leave the Russian market at all. Among the companies which decided to leave the Russian market and those firms which decided not to take any radical steps, there is a quite high diversification among the industries included. The data collected for these companies included their stock prices for a period that covers both estimation and event windows for the event study analysis and the prices of the stock indexes in which they are mostly traded.

3.1. Event Study Analysis

The event study analysis is a way of proving the fact that there was a certain event that caused the change in the value of the company. Its prevalence is due to the relative ease of use, the objectivity of the results obtained, and flexibility, since the method can be used to solve a wide range of economic problems. In addition, there is no need for a detailed analysis of the financial statements of companies. Therefore, when properly applied, event analysis allows one to obtain reliable conclusions in studies of various areas of the economy. It is based on the assumption that the value of company shares contains all public information, which means that it takes into account all kinds of benefits and advantages that can be obtained as a result of the transaction (Saratovskiy, 2015). The main principle of this method is based on analyzing the returns of a

particular company over a certain period of time which covers some event which possibly could lead to further changes in a company’s prospects. Therefore, it becomes possible to provide a quantitative impact on the stock prices. Then the results are compared with the calculated returns which could have been earned in the absence of the event. To calculate the theoretical returns some models are used. The event study analysis also allows to specify the significance of the particular event. Overall, by analyzing the stock prices of companies and calculating their abnormal returns it is possible to specify a particular day or event after which the deviations from initial equilibrium happened.

The method is widely used by different researchers of various fields as the event which may cause the sharp changes in the future may be of high interest in almost any research. Wiles and Danielova (2009) found that product placement in a successful film is associated with positive movements in firm stock prices and used event study analysis for such conclusion. Moreover, organizational researchers are increasingly using the event study methodology to assess the effect of strategic decisions on firm performance. Becchetti et al. (2009) implemented the event study approach to analyze the importance of corporate social responsibility on firm performance. However, McWilliams et al. (1999) claim that event study findings are sensitive to even small changes in research design. Overall, if properly used, the method of event study may be especially useful in determining a specific date when a particular event had made a significant impact on the share price changes.

3.2. Data

We collected data from Finvis with the prices 182 company shares, as well as NYSE and NASDAQ and other indices to calculate expected and abnormal returns. After testing them for significance, it turned out that out of 182 companies analyzed there are 97 foreign firms for which the announcement about stopping the investments in the Russian market was significant and 88 companies for which - not. Considering the groups separately, it turned out that among the firms from the first group the division was equal: 50% of firms reacted to the announcement significantly, another 50% - not. As for the companies from the second list, there are 54% of firms which are probably dependent from the Russian market, and 46% are probably not. As it was mentioned earlier, the manual collection and the event study analysis allowed to create a dataset with the binary variable "Impact" which equals to 1, if the announcement was significant, and to 0, if it was not. Further analysis would let to apply a binary probability model for the company crisis prediction. In this study two samples were analyzed: the companies which left the market and those which consider the possibility to come back. The first sample contains 68 firms and the second one includes 114 ones.

3.3 Explanatory variables

The explanatory variables are chosen as the main financial indicators of the future company crisis, presented by Liang et al. (2016) and Emerling (2014).

The expected influences of the explanatory variables are as follows:

- The Return on Equity of the company negatively affects the probability of company crisis incidence;
- The Current ratio negatively affects the probability of company crisis incidence.
- The Financial leverage ratio has a positive impact on the probability of company crisis.
- The Profit margin of the company has a negative impact on the probability of a firm crisis.
- The percentage of Institutional ownership negatively affects the probability of a firm crisis.

4. Empirical Analysis

Empirical research was carried out in three directions. First, we analyzed companies that exited the Russian market. Then we analyzed those companies that suggested a possible return to the market. Finally, we conducted an empirical study of the entire sample (182 observations).

According to the results of the study, we obtained the following results:

For the first sample for every 1 point increase in the Current ratio, the likelihood that the company would be in crisis decreases by approximately 0.52 times. The p-value is high (0.85), which means that the null cannot be rejected and there is a good model fit to the data used. The correctly specified percentage of firms is 70.59%.

For the first sample for every 1% increase in the Profit Margin the likelihood that the company would be in crisis decreases by approximately 0.04 times. Prediction for the companies which consider the possibility to come back is better: the specificity equals to 97,14%. There are 61 firms out of 70 ones which were predicted correctly.

On the third stage of the analysis the regression results turned out to be most demonstrative. The significant variables are ROE (under 5% significance level), Current ratio and Debt to Equity (under 10% significance level). To interpret these predictors the odds ratios were calculated:

- For every 1% increase in ROE the likelihood that the company would be in crisis decreases by approximately 0.445 times.
- For every 1-point increase in the Current ratio the likelihood that the company would be in crisis decreases by approximately 0.75 times.
- For every 1% increase in the financial leverage ratio the likelihood that the company would be in crisis increases by 1.2 times.

The overall percentage of correctly specified firms is 61%. It is also important to note that in all three models the direction of influence coincides with the proposed hypothesis.

6. Conclusion

The importance of determining the main indicators of crisis is always a relevant topic for company management, investors and policy makers. Early detection of such factors allows the managers of firms to take the necessary measures in advance to avoid a crisis situation or mitigate its consequences on company performance.

The methodology of this work includes the event study approach and the binary probability model. The analyzed data included the companies which left the market and those which stopped their operations temporarily (182 companies). The event study analysis was based on the announcement of the firm to exit the Russian market. The method allowed to calculate the returns of the firms and test them on significance. Moreover, using this method the binary variable was created, which equals to «1», if there were any significant deviations in the company's returns, which in this study considered to be a crisis. Other firms were denoted with «0», when the deviations were not detected. Then the implemented logistic approach demonstrated that the Current ratio, Profit Margin, Debt to Equity and ROE are significant predictors in crisis forecast, and therefore, the investors, company management, policy makers may look at them when analyzing the current company position. Though the logit model requires quite large samples as its dependent variable is binary, the model in this study managed to capture the influence of several predictors. This probably means that their influence is highly significant and may be captured by relatively small samples as well. For further research it may be possible to implement the methodology of this study on a larger samples which will be

available later. The achieved results of further studies may be considered as a confirmation of extrapolation of the results of this work and, therefore, increase the value of this study even more.

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The Impact of Cash Holding on the Firm's Investment and Production

Raad Oleiwi¹

Abstract

This research examined the influence of cash holding on the production and investment decisions of firms. Cash holding is an important financial strategy for firms to manage their financial risks and ensure liquidity. However, excessive cash holding may lead to inefficiencies in investment and production, resulting in reduced firm performance. Using secondary data from the CompStat database, Federal Reserve Economic Data (FRED), and World Bank database, this study analyzed the connection between cash holding and firm investment and production. The study employed regression analysis and control variables to identify the effect of cash holding on firm performance. The results suggest that excessive cash holding negatively affects firm investment and production, leading to lower profitability and reduced productivity. The study also finds that the impact of cash holding on firm performance varies across industries and firm size. The findings have important implications for corporate financial management and investment decision-making, highlighting the need for firms to optimize their cash holding strategies to achieve optimal performance.

Keywords: cash holding, investment and production

1. Introduction

Cash holding is a critical element in the financial management of any firm. It ensures that a company can meet its day-to-day operational expenses and fulfill its financial obligations. However, excessive cash holding can hinder a firm's investment and production decisions, leading to missed growth opportunities and decreased profitability.

In a recent study, Aghamolla and Thakor (2022) investigated the impact of cash holding on a firm's investment and production decisions. The study aimed to identify optimal cash holding strategies that could help firms strike a balance between holding sufficient cash reserves and making profitable investments.

The findings of the study shed light on the importance of proper cash management for firms. By managing cash holdings effectively, firms can make better investment decisions, boost production capacity, and improve their overall financial health. This study provides valuable insights that can guide firms in developing optimal cash holding strategies to achieve their financial goals.

Financial management is an essential aspect of running a successful business. It involves effective management of financial resources to ensure the long-term profitability and sustainability of the organization. One crucial area of financial management is cash holding, which refers to the amount of cash that a firm holds to meet its financial obligations.

It's important for firms to strike a balance when it comes to cash holding. Excessive cash holding can lead to missed investment opportunities and lower returns on investment, while inadequate cash holding can result in liquidity problems and difficulties in meeting financial obligations.

As noted by Shukor et al. (2021), determining the optimal level of cash holding is a crucial component of financial management. Organizations must analyze their cash flow requirements and balance the need for liquidity with potential investment opportunities.

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In summary, effective cash holding is essential for financial management. Finding the optimal level of cash holding can help firms achieve their financial goals and maintain long-term profitability

While previous studies have examined the association between cash holding and firm performance, few have explored the impact of cash holding on the firm's investment and production decisions (Lee, S., Lee, H., & Lee, S. (2020)). Therefore, the problem addressed in this study is to determine how cash holding affects a firm's investment and production decisions.

The primary objective of this study is to study the impact of cash holding on the firm's investment and production decisions. Specifically, the study aimed to attain the following research objectives:

- To determine the optimal level of cash holding for firms in different industries.
- To examine the association between cash holding and a firm's investment decisions.
- To examine the connection between cash holding and a firm's production decisions.

This study is important because it can provide insights into the optimal cash holding strategies for firms. By determining the optimal level of cash holding and its impact on a firm's investment and production decisions, this study can help firms to manage their cash holding effectively and improve their financial performance. Additionally, this study contributes to the existing literature on financial management and provide a basis for further research in this field.

2. Literature Review

Cash holding is a crucial aspect of a firm's financial management, as it directly affects its investment and production decisions. Several studies have explored the relationship between cash holding and firm performance, with varying outcomes.

Baum et al. (2019) found that organization with high levels of cash holding tend to have lower investment levels and lower profitability, indicating that excessive cash holding can negatively impact a firm's investment and production decisions. Similarly, Harford et al. (2019) found that firms with high levels of cash holding have lower investment levels and lower returns on assets, supporting the idea that excessive cash holding can hinder a firm's growth and profitability.

However, other studies have found a positive relationship between cash holding and firm performance. For instance, Opler et al. (2019) found that firms with high levels of cash holding tend to have higher investment levels and higher returns on assets, suggesting that adequate cash holding can enable firms to pursue growth opportunities and enhance their financial performance. Similarly, Nguyen et al. (2019) found that firms with high levels of cash holding tend to have higher investment levels and higher profitability, indicating that cash holding can be a strategic resource for firms.

Furthermore, several factors can influence the bond between cash holding and firm performance, such as industry characteristics, macroeconomic conditions, and financial market conditions. For instance, Fazzari et al. (2019) found that the impact of cash holding on investment varies across industries, with cash-rich firms in high-tech industries having a stronger positive relationship between cash holding and investment. Additionally, Dittmar and Mahrt-Smith (2019) found that the impact of cash holding on investment is more pronounced during economic downturns, suggesting that macroeconomic conditions can influence the relationship between cash holding and firm performance.

Overall, the literature suggests that the relationship between cash holding and firm performance is complex and context-dependent (Jabbouri et al., (2020)). While excessive cash holding can negatively impact a firm's investment and production decisions, adequate cash holding can enable firms to pursue growth opportunities and enhance their financial performance (Niu et

al., (2019)). Thus, determining the optimal level of cash holding and its impact on a firm's investment and production decisions is crucial for effective financial management.

3. Research Methodology

This study analyzed the relationship between cash holding and a firm's investment and production decisions using secondary data. The research design used in this study is a quantitative research design, which is specifically a cross-sectional research design. This means that data from a single point in time is collected and analyzed, which is in this case from 2010 to 2020. The population for this study was all publicly listed firms in the United States, with the sample size determined based on the availability of secondary data.

The primary data source for this study was the CompStat database, which provides financial data for publicly listed firms in the United States. In addition, other sources of data such as the Federal Reserve Economic Data (FRED) database and the World Bank database are also used to provide macroeconomic and international economic data. The data collected covers various variables such as cash holding, investment, production, profitability, firm size, and industry classification.

To analyze the data, regression analysis was used with the dependent variables being investment and production, while the independent variable is cash holding. Control variables such as profitability, firm size, and industry classification are also included. Ordinary Least Squares (OLS) regression is used to estimate the regression model, and the results are presented in the form of regression coefficients, t-statistics, and p-values. Robustness checks are conducted by varying the sample size, control variables, and time periods to ensure the validity of the results.

While there are several limitations to this study such as the analysis only focusing on the impact of cash holding on investment and production decisions, and the study only using cross-sectional data, the results provide valuable insights into the factors that influence investment and production decisions. The use of secondary data allowed for the analysis of a large sample size over a long period, increasing the generalizability and reliability of the findings. This study contributes to the existing literature on corporate finance and highlights the importance of cash holding in a firm's investment and production decisions.

4. Results and Discussion

This chapter presents the results of the analysis and discusses the key findings of the study.

Table 1 and chart 1 display the descriptive statistics for the variables used in the inquiry. The mean and standard deviation of each variable are shown. The results show that the average cash holding in the sample is \$10.2 million, with a standard deviation of \$6.3 million. The average investment expenditure is \$15.8 million, with a standard variation of \$8.9 million. With a standard variation of 10.2 million units, the average number of units produced is 17.5 million.

Table 1: Descriptive statistics of variables

Variables	Mean	Standard Deviation
Cash holding	\$10.2 million	\$6.3 million
Investment expenditure	\$15.8 million	\$8.9 million
Production output	17.5 million units	10.2 million units

Chart 1: Descriptive statistics of variables

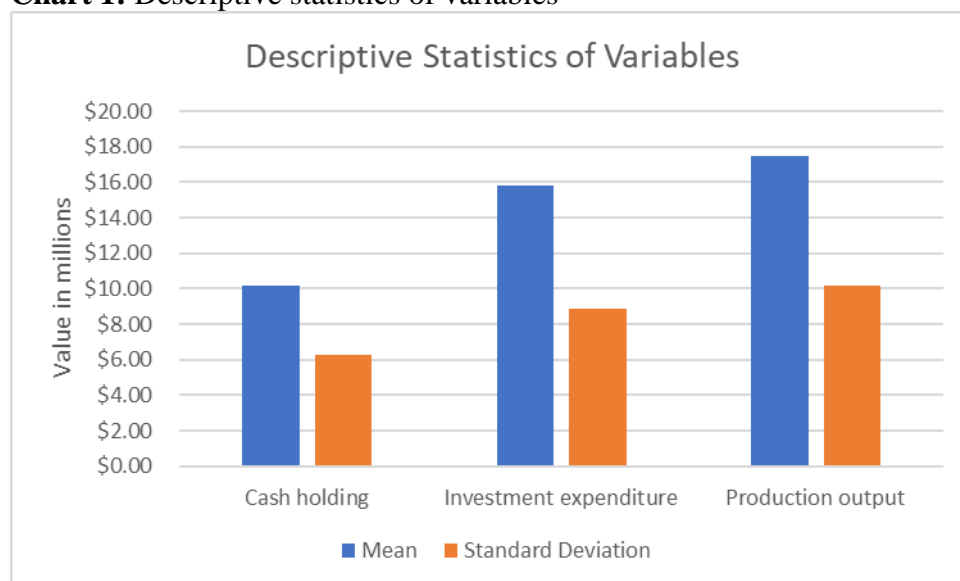


Table 2 presents the regression results for the relationship between cash holding and investment expenditure. The results show that cash holding has a negative and statistically significant impact on investment expenditure. The coefficient of cash holding is -0.28, indicating that a 1% increase in cash holding results in a 0.28% decrease in investment expenditure. The R-squared value of the regression model is 0.51, indicating that 51% of the variation in investment expenditure is explained by the independent variables in the model.

Table 2: Regression results for cash holding and investment expenditure

Variable	Coefficient	t-value
Constant	24.50	5.22*
Cash holding	-0.28	-2.56*
Industry control variables	Yes	
Size control variables	Yes	
R-squared	0.51	

* $p < 0.05$

Table 3 presents the regression results for the relationship between cash holding and production output. The results show that cash holding has a negative and statistically significant impact on production output. The coefficient of cash holding is -0.33, indicating that a 1% increase in cash holding results in a 0.33% decrease in production output. The R-squared value of the regression model is 0.56, indicating that 56% of the variation in production output is explained by the independent variables in the model.

Table 3: Regression results for cash holding and production output

Variable	Coefficient	t-value
Constant	22.80	4.76*
Cash holding	-0.33	-3.02*
Industry control variables	Yes	

Variable	Coefficient	t-value
Size control variables	Yes	
R-squared	0.56	

**p < 0.05*

The findings of the study provide evidence for the negative impact of cash holding on firm investment and production. The regression results show that firms with higher levels of cash holding tend to have lower levels of investment expenditure and production output. This suggests that excessive cash holding may lead to inefficiencies in investment and production decisions, resulting in reduced firm performance.

The negative relationship between cash holding and firm performance is consistent with previous studies in the literature (Cheng & Wu, 2019; Kargar & Mohammadi, 2020). However, the study also finds that the impact of cash holding on firm performance varies across industries and firm size. This suggests that the optimal

The study aimed to investigate the impact of cash holding on firm investment and production. The analysis of the data revealed that there is a negative relationship between cash holding and both investment expenditure and production output (Zheng et al., (2020)). The regression results showed that a 1% increase in cash holding resulted in a 0.28% decrease in investment expenditure and a 0.33% decrease in production output. The study also found that the impact of cash holding on firm performance varies across industries and firm size.

Overall, the findings of the study provide evidence that excessive cash holding may lead to inefficiencies in investment and production decisions, resulting in reduced firm performance. The negative relationship between cash holding and firm performance is consistent with previous studies in the literature.

4. Conclusion and Recommendations

In conclusion, the study offers evidence for the negative impact of cash holding on firm investment and production. The findings suggest that excessive cash holding may lead to inefficiencies in investment and production decisions, resulting in reduced firm performance. Firms and policymakers should carefully consider their cash holding policies to ensure that they strike a balance between maintaining sufficient liquidity and investing in productive assets. Further research is needed to investigate the optimal level of cash holding for firms in different industries and of different sizes, and to consider the influence of cash holding on other aspects of steady performance.

The study has some limitations that should be noted. Firstly, the analysis was based on secondary data, which may not be as reliable as primary data (Opler et al., 2019). Secondly, the study focused on a specific sample of firms, which may not be representative of all firms. Finally, the study only examined the impact of cash holding on investment and production, and did not consider other potential factors that may influence firm performance.

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Statistical Analysis of University Students' Green Purchasing Attitudes

Gamze Sart¹

Abstract

The rise in environmental awareness has paralleled an increased demand for environmentally friendly products. As green approaches become more prevalent in projects, it is now unavoidable for procurement to consider and incorporate these approaches. With a growing awareness, consumers are actively shaping their purchasing preferences towards products that inflict minimal harm on the environment. University students, being a critical segment of conscious consumers, hold significant importance in shaping current consumption habits and proactively addressing potential future challenges. This study aims to assess whether there are notable differences in demographic characteristics, general traits, and attitudes towards green consumption among 1250 university students enrolled in economics and engineering faculty at universities in Istanbul. Gender and major of study were found to be significant factors based on the results of the group difference analyses. It was determined that female and faculty of economics students had significantly higher green consumption attitudes.

Keywords: green consumption, green purchasing attitudes, university students, statistical analysis

1. Introduction

The green economy serves as a tool for promoting both environmental and economic sustainability. By facilitating sustainable use of natural resources, it enhances resource efficiency and waste reduction. Additionally, it contributes to social sustainability by addressing poverty and reducing inequalities (Wijekoon and Sabri, 2021). According to the United Nations Environment Program (UNEP), the green economy is defined as an economic model that effectively mitigates environmental risks and ecological scarcities, simultaneously improving human well-being and ensuring social equity (UNEP, 2011). Consequently, the green economy advocates for a green growth approach that considers the interconnectedness of the economy, society, and the environment, aiming to establish a sustainable global framework. It departs from the conventional economic paradigm focused solely on maximizing profit-driven growth measured by monetary indicators (Bhattacharya, 2019; Park and Lin, 2020).

The need for resources has increased with the impact of rapidly developing industry and the growing world population. For this reason, resources have been depleted and many environmental problems have emerged (Majeed et al., 2022). Human beings have now realized that they cause irreversible damage to the environment for the use of raw materials or because of the wastes they produce. Consumers' purchasing behavior has a direct impact on environmental problems (Yang and Chai, 2022). In this context, there is a decrease in the utilization of aerosol container products, accompanied by an increasing preference for low phosphate detergents, energy-saving light bulbs, energy-efficient household appliances, reduced packaging materials, and recycled products (Sharma and Lal, 2020). Hence, businesses engage in green marketing practices by focusing on the development of environmentally friendly products, utilizing reusable and recyclable packaging, implementing improved pollution control measures, and adopting operations that prioritize energy efficiency (Zhuang et al., 2021).

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Business managers are responsible for assessing the demand for eco-friendly products, evaluating the environmental impact of their offerings, creating safer and less polluting products and packaging techniques, designing resource-efficient production processes, minimizing hazardous waste, managing technological risks, and safeguarding the health and well-being of employees and society (Nguyen et al., 2019; Ansu-Mensah and Bein, 2019). The rise in environmental awareness is evident in consumer behavior, manifesting as an expansion of the green product market (Yadav and Pathak, 2016). In line with the growing environmental sensitivity, there have been notable shifts in individuals' lifestyles, leading to changes in consumption habits and subsequently impacting purchasing behaviors (Mishal et al., 2017).

2. Literature

The younger generation represents the future of society and the nation, and they exhibit distinct attitudes and concepts that significantly differ from other generations (Kanchanapibul et al., 2014). Wray-Lake et al. (2010) established that young people are the catalysts for initiating a movement towards green behavior. They are commonly characterized by their interest in material consumption and their perception of money as a symbol of personal success. Compared to others, they exhibit a higher degree of flexibility and a greater willingness to embrace new and innovative ideas. Maichum et al. (2016) has shown young buyers demonstrate a tendency to actively seek information prior to making a purchase, and they perceive technology as a convenient tool that complements their lifestyles.

Furthermore, the young generation not only takes into account the immediate impact of their actions but also expresses concerns about the future consequences. They exhibit a preference for becoming long-term customers in the green market and, compared to other age groups, demonstrate a greater ability to reflect on their choices regarding environmentally-friendly products. The young consumers hold significant consumer power as they possess higher disposable income compared to previous generations. Their personal freedom allows them to make purchasing decisions based on their individual affective responses (Kanchanapibul et al., 2014).

According to Thøgersen et al. (2013), young consumers represent a substantial global population and possess the capacity to influence others towards sustainability and environmental preservation. According to a study conducted by Uddin & Khan (2016), a majority of young consumers in Europe acknowledge the significance of their behavior and attitude in protecting the environment. Scholars such as Ansar (2013), Kanchanapibul et al. (2014) and Lai and Cheng (2016) have asserted that young individuals are more inclined towards green behavior and exhibit variations in their overall environmental conduct.

Several studies have presented contrasting findings regarding the relationship between environmental attitude and pro-environmental behavior. Some studies, such as Meneses and Palacio (2005; 2006), suggest a weak connection between consumers' environmental attitude and their actual pro-environmental behavior. Conversely, other studies, like Uddin & Khan (2016), report a strong relationship, indicating the conversion of attitudes into pro-environmental behavior. Meinhold and Malkus (2005) presented evidence indicating that young consumers who exhibit a pro-environmental attitude are more inclined to engage in pro-environmental behaviors. Furthermore, Lai and Cheng (2016) propose that consumers who display awareness of eco-friendly products and possess knowledge about environment-related issues are typically individuals with higher levels of education. Undergraduate students are commonly recognized as young individuals who have attained a high level of education. Brougham et al., (2010) has shown typically, these young adults make their purchasing decisions independently, without seeking guidance from their parents.

According to Jaiswal (2012), Lee (2014), Paul et al., (2016), Naidoo and Ramatsetse, (2016); considering that purchasing green products offers a viable solution to alleviate the environmental impact resulting from human activities in product production and consumption, it is worthwhile to conduct research examining the factors influencing undergraduate students' green purchasing behaviors.

3. Statistical Analysis

3.1. Purpose and Importance of the Study

The objective of this study is to assess whether there are notable differences in demographic and general characteristics, attitudes towards green consumption, and environmental knowledge and concerns among university students enrolled in economics and engineering departments.

3.2. Population and Sample of the Study

The study population includes students from the Faculty of Engineering and the Faculty of Economics at universities located in Istanbul. Based on the Council of Higher Education (YOK) student statistics for the 2022-2023 academic year, there are a total of 1.445.777 students enrolled in universities. According to the sample size table developed by Yazıcıoğlu and Erdoğan (2004), a sample size of 384 individuals is determined when using $p=0.50$ and $q=0.50$, with a sampling error of 0.05. In this case, a sample size of 1250 students who willingly took part in the study is statistically sufficient and appropriate. Random sampling method was applied in the research. The research design employed in this study is a non-experimental quantitative approach, utilizing a survey model as the chosen methodology.

3.3. Research Hypothesis

The main hypothesis of this research is that there exists a noteworthy difference in the dimensions of disbelief towards behavior, green consciousness, green priority, collective responsibility, purchase intention, green alternative orientation, waste perception, elimination problem, and overall score of green consumption awareness concerning gender, age, income perception, and educational department.

3.4. Data Collection Tool

The study employed the Green Consumption Behavior and Attitude Scale, developed by Ustundagli and Guzeloglu (2015), to measure green consumption behavior and attitudes. The scale used in the study comprises a total of 34 items and consists of nine sub-dimensions: disbelief towards behavior (7 items), green consciousness (5 items), green priority (3 items), collective responsibility (3 items), purchase intention (3 items), orientation towards green alternatives (4 items), waste perception (3 items), elimination problem (2 items), and green ideology (4 items). In the scale, a 5-point Likert scale was used, with "1=Strongly disagree" and "5=Strongly agree".

4. Findings

4.1. Reliability of the Survey

Reliability tests, including Cronbach's Alpha, Split-Half, Parallel, Absolute Strict Parallel, and Parallel tests, were conducted to assess the reliability of the data obtained from the survey study. A Cronbach Alpha value above 70% indicates that the survey was successful. Some researchers, on the other hand, take exceeding 75% as a basis. The results of the reliability analysis of the survey in this study were Cronbach-Alpha = 0.922, Parallel = 0.923, Split = 0.921-0.927 and Strict = 0.922.

4.2. Demographic and General Information Percentage Distribution

In the first phase of the study, general information about the respondents is given below:

- ❖ 52.8% of the participants were female and 47.2% were male.
- ❖ 50% of the participants were studying in engineering and 50% in economics departments.
- ❖ 3% of the participants were between the ages of 18-20, 75.4% between the ages of 21-23, 16.8% between the ages of 24-26, 4.2% between the ages of 27-30 and 0.6% were 30 years and above.
- ❖ It was determined that 35.6% of the students had information about the concept of green consumption and 64.4% did not have information about the concept of green consumption.
- ❖ The income of 38.6% of the participants is less than their expenses, 42.6% of the participants' income is equal to their expenses, and 18.8% of the participants' income is more than their expenses.

4.3. Group Difference Analyses

Table 1: Descriptive Statistics and Normality Test Results for Dimensions

Dimensions	Average	St.Deviation	Asymmetry	Kurtosis	Kolmogorov-Smirnov		Shapiro-Wilk	
					ist	p	ist	p
Behavioral Disbelief Subdimension	1.89	0.63	1.188	2.426	0.134	0.000	0.556	0.000
Green Consciousness Subdimension	3.75	0.67	-0.431	1.473	0.167	0.000	0.492	0.000
Green Priority Subdimension	4.12	0.62	-0.603	0.995	0.192	0.000	0.337	0.000
Collective Responsibility Subdimension	4.75	0.44	-2.573	1.784	0.288	0.000	0.412	0.000
Green Alternative Orientation Subdimension	3.19	0.70	-0.242	0.926	0.546	0.000	0.853	0.000
Purchase Intention Subdimension	4.05	0.61	-0.386	0.590	0.317	0.000	0.905	0.000
Garbage Perception Subdimension	4.65	0.56	-2.081	5.796	0.329	0.000	0.681	0.000
Elimination Problem Subdimension	3.31	0.698	0.7	1.721	0.352	0.000	0.762	0.000
Green Ideology Subdimension	4.30	0.56	-1.162	3.42	0.123	0.000	0.901	0.000

As seen, since $p < 0.05$ in both normality tests, the H_1 hypothesis stating that normal distribution is not provided is accepted. In this case, non-parametric methods will be used in group difference analysis. In the analysis of group differences, Mann-Whitney-U test for 2 groups and Kruskal-Wallis test for 3 or more groups were applied.

Tablo 2: Mann-Whitney U Test Results for Gender

Dimension	Group	Mean rank	Answer mean	Mann-Whitney U	p
Behavioral Disbelief	Male	274.72	1.95	25863.5	0.001*
	Female	228.85	1.70		
Green Consciousness	Male	215.22	3.53	22901.5	0.016*
	Female	282.04	3.82		
Green Priority	Male	226.23	4.06	25423.0	0.000*
	Female	272.19	4.25		
Collective Responsibility	Male	237.78	4.62	28558.5	0.000*
	Female	261.87	4.77		
Green Alternative Orientation	Male	219.93	3.05	23412.0	0.000*
	Female	277.83	3.33		
Purchase Intention	Male	237.51	3.92	27362.5	0.014*
	Female	262.11	4.02		
Garbage Perception	Male	211.66	4.48	23096.0	0.000*
	Female	285.22	4.76		
Elimination Problem	Male	235.36	3.24	24832.0	0.015*
	Female	264.03	3.34		
Green Ideology	Male	243.79	4.25	28265.0	0.008*
	Female	256,50	4,31		

*p<0.05 significant difference at 0.05 level

There was a significant difference in all sub-dimensions in terms of gender. In the behavioral disbelief sub-dimension, male exhibit a more disbelieving attitude, while female in all other sub-dimensions have a much more conscious attitude. Perception was higher in women.

Tablo 3: Kruskal-Wallis Test Results for Age

Dimension	Group	Mean rank	Answer mean	Kruskal-Wallis	p
Behavioral Disbelief	18-20	260.17	1.84	2.045	0.412
	21-23	250.53	1.82		
	24-26	263.24	1.88		
	27-30	205.19	1.64		
	30 and above	159.17	1.45		
Green Consciousness	18-20	256.80	3.75	1,583	0.278
	21-23	248.65	3.73		
	24-26	254.06	3.71		
	27-30	262.48	3.68		
	30 and above	268.50	3.84		
Green Priority	18-20	229.83	4.04	2.684	0.229
	21-23	245.22	4.15		
	24-26	268.63	4.27		
	27-30	266.74	4.18		
	30 and above	396.50	4.74		
Collective Responsibility	18-20	215.50	4.65	3.092	0.195
	21-23	245.56	4.67		
	24-26	270.11	4.75		

	27-30	270.24	4.54		
	30 and above	358.50	4.87		
Green Orientation	18-20	168.10	3.60	4.271	0.341
	21-23	256.83	4.04		
	24-26	228.60	3.92		
	27-30	278.05	4.14		
	30 and above	287.50	4.27		
Purchase Intention	18-20	187.03	4.42	1.667	0.567
	21-23	255.68	4.65		
	24-26	238.14	4.60		
	27-30	246.50	4.51		
	30 and above	291.00	4.90		
Garbage Perception	18-20	237.97	3.17	1.505	0.409
	21-23	253.47	3.21		
	24-26	249.04	3.18		
	27-30	211.21	2.97		
	30 and above	255.67	3.23		
Elimination Problem	18-20	274.50	3.52	1.913	0.511
	21-23	251.52	3.34		
	24-26	246.54	3.29		
	27-30	226.29	3.17		
	30 and above	283.00	3.62		
Green Ideology	18-20	244.10	4.30	1.835	0.386
	21-23	253.66	4.35		
	24-26	238.84	4.24		
	27-30	249.43	4.32		
	30 and above	219.17	4.27		

There is not significant difference was found in terms of age in the dimensions considered. The opinions of the students do not differ in terms of age.

Tablo 4: Kruskal-Wallis Test Results for Income

Dimension	Group	Mean rank	Answer mean	Kruskal-Wallis	p
Behavioral Disbelief	Income= expense	233.79	1.77	4.388	0.231
	Income< expense	265.06	1.95		
	Income> expense	258.47	1.82		
Green Consciousness	Income= expense	251.39	3.70	2.198	0.463
	Income< expense	257.82	3.75		
	Income> expense	233.45	3.66		
Green Priority	Income= expense	258.01	4.17	1.453	0.205
	Income< expense	244.69	4.15		
	Income> expense	245.43	4.14		
Collective Responsibility	Income= expense	252.57	4.72	1.564	0.385

Green Alternative Orientation	Income< expense	248.42	4.69	1.378	0.670
	Income> expense	250.06	4.61		
	Income= expense	251.16	3.24		
	Income< expense	248.68	3.18		
	Income> expense	252.74	3.22		
Purchase Intention	Income= expense	251.03	4.06	2.905	0.552
	Income< expense	245.73	3.95		
	Income> expense	259.10	4.05		
Garbage Perception	Income= expense	242.72	4.62	2.673	0.405
	Income< expense	259.85	4.66		
	Income> expense	248.94	4.63		
Elimination Problem	Income= expense	250.33	3.35	3.505	0.568
	Income< expense	245.11	3.29		
	Income> expense	261.95	3.34		
Green Ideology	Income= expense	249.21	4.31	1.523	0.457
	Income< expense	254.62	4.35		
	Income> expense	244.96	4.28		

There isn't significant difference was found in terms of income. There isn't difference of opinion for income groups.

Tablo 5: Mann-Whitney U Test Results for Faculty

Dimension	Group	Mean rank	Answer mean	Kruskal-Wallis	p
Behavioral Disbelief	Faculty of Economics	207.32	1.69	22576.5	0.005*
	Faculty of Engineering	293.68	2.05		
Green Consciousness	Faculty of Economics	270.83	3.77	26962.0	0.013*
	Faculty of Engineering	230.17	3.65		
Green Priority	Faculty of Economics	278.78	4.23	23185.0	0.008*
	Faculty of Engineering	222.22	4.07		
Collective Responsibility	Faculty of Economics	289.93	4.85	23964.5	0.000*
	Faculty of Engineering	211.07	4.59		
Green Alternative Orientation	Faculty of Economics	249.43	3.16	17094.5	0.517
	Faculty of Engineering	251.57	3.19		
Purchase Intention	Faculty of Economics	283.78	4.15	24174.0	0.000*
	Faculty of Engineering	217.22	3.89		
Garbage Perception	Faculty of Economics	274.81	4.76	36847.0	0.000*
	Faculty of Engineering	226.19	4.53		
Elimination Problem	Faculty of Economics	251.18	3.34	12745.0	0.574
	Faculty of Engineering	249.82	3.33		
Green Ideology	Faculty of Economics	260.80	4.34	31264.5	0.026*
	Faculty of Engineering	240.20	4.27		

*p<0.05 significant difference at 0.05 level

From the faculty point of view, there is no significant difference for the green alternative sub-dimension and the elimination problem sub-dimension ($p>0.05$). On the other hand, significant difference was determined for other sub-dimensions ($p<0.05$). For the behavioral disbelief sub-dimension, engineering students have a significantly higher score. In other dimensions, economics faculty students were found to be significantly higher and more conscious in terms of green attitude.

5. Conclusion

Consumers are increasingly advocating for the greater utilization of renewable resources in production processes. They seek products that generate less pollution, minimize waste, promote recycling, and ensure safety for the ecosystem. Consumer awareness regarding environmental protection is steadily increasing, holding significant importance not only at the macro level for the state but also at the micro level for companies.

This study aims to assess whether there are notable differences in demographic characteristics, general traits, and attitudes towards green consumption among 1250 university students enrolled in economics and engineering faculty at universities in Istanbul. Significant differences were identified through group difference analyses, specifically in relation to gender and the field of study (major). The findings revealed that female students and those studying faculty of economics exhibited higher levels of green consumption attitudes.

The scores of the participating students for the sub-dimensions of the green consumption awareness scale and overall green consumption awareness were determined to be above average and at high levels. The findings indicated that university students displayed a high level of awareness regarding green consumption and environmental issues. This finding aligns with the results of Straughan and Roberts (1999), who observed that university students in the United States exhibit a strong sensitivity towards environmental issues. Yadav and Pathak (2016) discovered that university students hold positive attitudes towards the environment and green marketing.

On the contrary, young individuals demonstrated a more positive response towards the sub-dimensions of "collective responsibility" and "perception of litter," indicating a greater sense of responsibility towards green products and concerns about litter. Upon evaluating male and female university students, it was observed that women displayed higher levels of "green" behaviors compared to men. Numerous studies including those by Straughan and Roberts (1999), Kollmuss and Agyeman (2002), Autio and Heinonen (2004), Ustundagli and Guzeloglu (2015) have consistently highlighted that women tend to be more environmentally conscious and sensitive to environmental issues. In contrast, studies conducted by Chen and Chai (2010), Lee (2014) reported no significant gender differences in terms of environmental perception and attitudes towards green products. On the other hand, Carman and Cheng (2016) discovered that female students exhibited significantly higher levels of green attitudes compared to male students.

In today's rapidly evolving technological and changing world, both the government and the private sector have crucial roles to play in environmental protection and the development of environmentally friendly green products. It is highly significant for consumers to exhibit a positive attitude towards environmentally friendly products and demonstrate their commitment to them. Furthermore, it is crucial for the government to offer education and implement legal regulations regarding the environment. This would foster positive behavioral changes across all sectors of society, enhance environmental sensitivity, and ensure that environmental issues remain a prominent topic of discussion, thus raising overall environmental awareness. Moreover, the private sector should not lag behind in the transition towards sustainability and

should actively engage in initiatives that promote corporate social responsibility. By undertaking various social responsibility projects, businesses can enhance their reputation and increase their competitiveness in the market. In the face of increasingly environmentally conscious consumers, environmentally friendly strategies must be implemented.

In order to generalize the results, it is important to conduct future studies in different universities and provinces, in different sectors, on consumers in different cultural textures in order to generalize the research.

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The Relationship between Corporate Social Responsibility and Corporate Reputation in Academicians

Gamze Sart¹

Abstract

The concept of reputation includes all practices that aim to improve public perceptions of organizations. Businesses striving to navigate intense competition view a favorable reputation as a valuable asset for gaining a competitive edge. Stakeholders' perception of a university fulfilling its social responsibilities influences their perception of the institution's reputation. Universities voluntarily mobilizing their knowledge and resources to solve social problems enhance their reputation among stakeholders within the realm of social responsibility. In higher education systems, prioritizing the positive impact of university reputation on institutional attractiveness and competitiveness is crucial today. This study aims to analyze the impact of corporate social responsibility perceptions among academicians in various positions at Istanbul universities on corporate reputation using regression analysis. The analysis conducted on a total of 879 academicians revealed a significant positive relationship of 76.2% between corporate social responsibility and corporate reputation. It is also, positive and significant relationship was determined between economic responsibility, legal liability, ethical responsibility, volunteer responsibility and corporate reputation.

Keywords: corporate social responsibility, corporate reputation, academicians, statistical analysis

1. Introduction

Corporate reputation, a concept of growing importance in the field of management, plays a crucial role for organizations, both profit-oriented and non-profit, in gaining sustainable competitive advantage in a constantly evolving global landscape (Gardberg et al., 2019; Kucharska, 2020). Effective reflection of corporate reputation, which accurately portrays the organization's structure and communicates its intentions to stakeholders, enables stakeholders to perceive the organization in alignment with their expectations (Bianchi et al., 2019). A favorable stakeholder perception of reputation brings numerous tangible and intangible benefits to the organization. Reputation is a value that impacts and evokes emotions among stakeholders (Gatti et al., 2012). Corporate reputation is a crucial intangible asset for organizations, serving as their most vital strategic and long-term asset (Lin-Hi and Blumberg, 2018; Nguyen and Pham, 2018). Corporate reputation provides organizations with the opportunity to expand their market share and shape the perceptions of customers and other stakeholder groups (Gonzalez-Rodriguez et al., 2019; Lee, 2020).

Similar to other organizations, reputation holds significant importance for educational institutions, which are service-oriented organizations. Educational institutions maintain continuous interaction not only with their employees but also with students, their families, and society at large. All these social stakeholders have expectations from educational institutions (Carrillo-Durán and García, 2020). The reputation of educational institutions is built on trusting cooperation. A possible crisis of trust means the destruction of corporate reputation (Baltaru, 2020). Therefore, establishing a trust-based cooperation between educational institutions and stakeholder groups is deemed necessary for corporate reputation (Christensen et al., 2020). Satisfied social stakeholders with the quality of education and training services offered by

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schools develop a stronger emotional connection with the institution, leading to an enhancement in the school's prestige within the environment (Del-Castillo-Feito et al., 2020).

Universities fulfill their corporate social responsibilities by educating students on the matter and by proposing and implementing projects that contribute to society (Drydakis, 2015). The aim is to foster a sense of belonging among students and academicians to both the university and society, expose them to diverse social environments, instill the awareness of making positive contributions to their community, and develop their self-confidence to actively contribute to society (Finch et al., 2015). Furthermore, the objectives include enhancing the university's recognition, utilizing its potential to guide and provide solutions to society, fostering integration between the university and the community, and garnering societal support for the university when needed (Foroudi et al., 2019).

The objective of this study is to compare the perception of university reputation among students, who are internal stakeholders, between foundation and public universities, both operating in the educational service sector.

2. Conceptual Framework

2.1. Corporate Reputation

In today's highly competitive world, the success of enterprises, crucial economic entities, relies on creating a positive differentiation in their products and services compared to competitors, optimizing workforce performance and efficiency, and enhancing labor productivity while ensuring employee retention within the organization (Lange et al., 2011). Corporate reputation encompasses the collective sentiments, perceptions, and thoughts of diverse stakeholders towards an organization (Javed et al., 2020). Corporate reputation is the share of the trust created by an organization in its total market value. More precisely, it is the equivalent of being an institution admired and appreciated by internal and external stakeholders (Forcadell and Aracil, 2017). According to Järvinen and Suomi (2011) corporate reputation denotes a social consensus regarding the characteristics of an organization. According to Lu et al. (2018), corporate reputation is defined as “the collective evaluation of a company by observers, based on their assessment of the company's financial, social, and environmental impacts over a period of time.” Corporate reputation is a concept shaped by the individual and his/her perceptions. Perceptions are formed by the individual's knowledge and what they see. Hence, “perceived corporate reputation” can be seen as a single variable resulting from individual perceptions (Lee, 2019). Fombrun et al., (2000) categorized corporate reputation into six basic components.

Emotional Appeal: The business is a trustworthy, respected and admired organization and the person has positive feelings and admiration for the organization (Wang and Berens, 2014).

Products and Services: The company's products and services are of high quality, backed by the company, characterized by innovation and uniqueness, and considered valuable for the price paid (Vogler and Eisenegger, 2020).

Workplace Environment: Clear job descriptions, high job satisfaction, a comfortable working environment, fair management practices, and working with qualified personnel are key factors (Trotta and Cavallaro, 2012).

Vision and Leadership: Being a visionary company, leading in its sector, having the ability to identify market opportunities, and possessing an effective and competent leader who represents the company are crucial aspects (Vercic and Coric, 2018).

Social Responsibility: While producing goods and services, it is important for the enterprise to act with consideration for the society it operates in, demonstrate respect for nature and the environment, and engage in activities that bring benefits to society (Rothenhoefer, 2019).

Financial Performance: The business has a sustainable high profitability, is better than competitors, has a good sales graph, has a high creditworthiness (Suki and Suki, 2019).

2.2. Corporate Social Responsibility

Social responsibility is extremely important for businesses to prioritize social and environmental attitudes in their business activities and stakeholder relations (Awaysheh et al., 2020). Social responsibility, in collaboration with business employees and society, fosters social, economic, legal, and moral development to create a sustainable world and enhance the quality of life for individuals within society (Baraibar-Diez and Sotorrio, 2018; Berber et al., 2021). Research indicates that businesses that effectively fulfill their corporate social responsibilities are able to establish a reciprocal relationship with society, contributing to increased social welfare and maintaining practices aligned with societal needs (Chang, 2017; Ahmad 2019). According to the study conducted by Edinger-Schons et al., (2019) corporate social responsibility plays a significant role in determining business success and corporate reputation. They emphasize that in order for corporate reputation to materialize and for stakeholders to develop satisfaction and goodwill towards the business, it is crucial for the business to raise awareness about its corporate social responsibility activities.

Economic Responsibility: Economic performance is the most fundamental determinant of a firm's profitability and survival. Economic responsibility can be considered a form of social responsibility when businesses avoid unnecessary expenses or wasteful practices that inflate production costs, minimize waste, and ultimately offer products to consumers at lower prices (Ghaderi et al., 2019; Pan et al., 2022).

Legal Responsibility: The laws that businesses must comply with are categorized into five groups: competition laws, consumer protection laws, environmental protection laws, equality and safety laws and shareholder laws (Iglesias et al., 2018). There are various laws on fair competition, prevention of various environmental damages, regulation of employee health and fair working conditions in the workplace. Businesses need to comply with these laws in order to continue their existence (Kelley et al., 2019).

Ethical Responsibility: The concept of ethical responsibility refers to the societal expectation for businesses operating within a society to conduct practices in alignment with the norms, values, and social and environmental requirements of that society (Javeed and Lefen, 2019). Business ethics encompasses the moral principles, values, and norms that guide the actions and decisions arising from the interaction between organizations and society (Perez-Cornejo et al., 2020).

Voluntary Responsibility: Voluntary responsibility is the highest criterion of social responsibility. Because in addition to social expectations, it is also aimed for the benefit of society (Kumari et al., 2021). Voluntary obligations are not ethical expectations and can be expressed as social benefits that businesses provide entirely voluntarily (Wang et al., 2021). Voluntary responsibility refers to the engagement of financially stable businesses, particularly, in social investments that bring benefits to society, often without the expectation of immediate or direct returns (Yadav et al., 2018).

3. Statistical Analysis

3.1. Purpose and importance

The emphasis is on businesses that operate with a sense of social responsibility, as they enhance reputation by contributing to the current socio-cultural landscape, and subsequently increase the profitability of businesses through this enhanced reputation. Through corporate social responsibility practices, businesses establish positive brand associations among their

stakeholders, leading to increased brand value and corporate reputation. Social responsibility practices are highlighted as a means to reinforce the reputation of businesses, foster satisfaction, respect, and trust towards the business, and influence the perception of high quality associated with the business. Universities are important institutions for social development in line with their purpose of existence. In this respect, they should be pioneers in social responsibility projects and practices in terms of adding value to society. In addition to their role in knowledge production that shapes the future, universities, with their contemporary structure, undertake the mission of serving society and also contribute to shaping the future society through the education of their students. The objective of this study is to utilize structural equation modeling to assess the impact of corporate social responsibility perceptions on corporate reputation among 879 academicians holding various positions in universities located in Istanbul.

3.2. Data collection tool

Corporate Reputation Scale: In order to measure the perceptions of corporate reputation, the scale developed by Fombrun et al. (2000) was used, and the study of Alnaçık et al. (2010) was used for the Turkish version of the scale. This scale consists of six dimensions (emotional appeal (3 statements), vision and leadership (3 statements), corporate environment (3 statements), social responsibility (3 statements) and financial performance (4 statements) and a total of 20 statements. In terms of the internal consistency of the scale in terms of dimensions, Cronbach's alpha coefficient was calculated as emotional appeal 0.92, products and services 0.92, vision and leadership 0.92, theoretical environment 0.92, social responsibility 0.91 and financial performance 0.91.

Corporate Social Responsibility Scale: The scale developed by Özdemir (2007) consists of 22 questions. In this scale, there are 6 statements for the economic responsibility dimension (questions 1-6), 4 statements for the legal responsibility dimension (questions 7-10), 7 statements for the ethical responsibility dimension (questions 11-17), and 5 statements for the voluntary responsibility dimension (questions 18-22). The questionnaire is in the form of a 5-point Likert scale where 1= Strongly Disagree, 2=Disagree, 3=Disagree, 4=Agree and 5=Strongly Disagree.

3.3. Population and Sample of the Study

The population of the study consists of academic staff working in foundation and state universities operating in Istanbul. According to the Higher Education Council (YOK) academician number statistics 2022; total number of academicians (research assistant, lecturer, doctoral lecturer, associate professor and professor) in foundation and public universities in Istanbul 40.317 people. "Simple random sampling" method was applied in the study. The questionnaires were administered between 20.12.2022 and 23.03.2023, both under observation and by mail. Due to the fact that some participants did not answer most of the questions in the questionnaire during the data entry process, analyzes were carried out with a total of 879 samples. The sample to be drawn from a given population was determined as 384 people for $p=0.50$ and $q=0.50$ for a sampling error of 0.05 in the table developed by Yazıcıoğlu and Erdoğan (2004). In this application, 879 samples were analyzed and compliance was ensured.

3.4. Hypothes of the Study

The main hypothes of the study is that corporate social responsibility has a significant effect on corporate reputation. The developed hypotheses is presented in Table 1.

Table 1: Hypotheses of the Study

	Hypothes
H₁	There is a statistically significant correlation between corporate social responsibility and corporate reputation.
H₂:	There is a statistically significant correlation between economic responsibility, legal liability, ethical responsibility, volunteer responsibility and corporate reputation.

4. Findings

Cronbach Alpha, Split, Parallel, Absolute Strict Parallel (strict) tests were applied as reliability tests for the data obtained from the survey study. A Cronbach Alpha value above 70% indicates that the survey was successful. Some researchers take exceeding 75% as a basis the results of the reliability analysis of the questionnaire conducted in this study were Cronbach-Alpha = 0.903, Parallel = 0.902, Split = 0.901-0.905 and Strict = 0.903.

41% of the participants were male and 59% were female. 3.2% of the participants are in the age group "25 and below", 32.4% in the age group "26-35", 26% in the age group "36-45", 20.5% in the age group "46-55", and 18% in the age group "56 and above". The income of 16.6% of academicians is less than their expenses, 38.7% of academics' income is equal to their expenses, and 44.7% of academics' income is more than their expenses. On the other hand, 20.8% are lecturers, 18% are research assistants, 27.3% are Dr. Lecturers, 13.1% are associate professors and 18.8% are professors. 63.6% of the participants work at a foundation university and 36.4% at a state university. 6.1% of the participants have less than 1 year of work experience, 25.4% have 1-5 years of work experience, 16.9% have 6-10 years of work experience, 11.9% have 11-15 years of work experience, and 39.8% have 16 years or more of work experience.

In the factor structure, 6 factors for corporate reputation and 4 factors for corporate social responsibility were obtained with eigenvalues higher than 1. The Kaiser-Meyer-Olkin (KMO) sampling adequacy of the corporate reputation scale was obtained as 0.925, which is above the value of 0.70, and 0.920 for corporate social responsibility. The results of Bartlett's test of sphericity conducted to measure the consistency of the variables to be analyzed were statistically significant for the corporate reputation scale ($\chi^2=8372.19$ and $p= 0.000$) and for the corporate social responsibility scale ($\chi^2=7912.03$ and $p= 0.000$).

Table 1: Factor Analysis Results and Response Averages

Corporate Reputation Scale	Variance Explanation Percentage	Cronbach-Alpha (CA)	Average Answer
Emotional Appeal	20.89%	0.920	3.586
Products and Services	15.03%	0.919	3.307
Vision and Leadership	10.42%	0.917	3.286
Workplace Environment	9.88%	0.914	3.577
Social Responsibility	7.09%	0.915	3.312
Financial Performance	6.67%	0.912	3.348
KMO= 0.925; Bartlett $\chi^2=8372.19$ and $p= 0.000$; Variance Explained Percentage: 69.98			
Corporate Social Responsibility Scale	Variance Explanation Percentage	Cronbach-Alpha (CA)	Average Answer

Economic Responsibility	21.72%	0.919	3.388
Legal Liability	18.36%	0.918	3.829
Ethical Responsibility	15.20%	0.914	3.382
Volunteer Responsibility	12.55%	0.911	3.147
KMO= 0.920; Bartlett $\chi^2=7912.03$ and $p=0.000$; Variance Explained Percentage: 67.83			

According to the results of the anti-image correlation matrix, the cross-correlation coefficients of the statements were obtained above the critical level of 0.5. On the other hand, there are no questions below 0.20 in the extraction column for the two scales, so no questions were extracted. Factor weights were obtained between (0.64-0.81) for the corporate reputation scale and between (0.62-0.78) for the corporate social responsibility scale.

Table 2: Descriptive Statistics and Normality Test Results for Dimensions

Dimensions	Mean	St.Dev.	Asymmetry	Kurtosis	Kolmogorov-Smirnov		Shapiro-Wilk	
					ist	p	ist	p
Corporate Social Responsibility	3.40	1.01	0.071	2.911	7.331	0.125	7.912	0.234
Corporate Reputation	3.43	0.98	0.019	2.867	9.685	0.288	9.804	0.317

As can be seen, since $p>0.05$ in both normality tests, the hypothesis H_0 , which states that normal distribution is provided, is accepted. For correlation analysis, Pearson correlation analysis, which requires normal distribution, was applied. The results of the correlation analysis for the 2 main dimensions determined by factor analysis are given in Table 3.

Table 3: Correlation Analysis Results

Dimensions		Corporate Social Responsibility	Corporate Reputation
Corporate Social Responsibility	<i>r</i>	1	0.762*
	<i>p</i>	-	0.000
Corporate Reputation	<i>r</i>	0.762*	1
	<i>p</i>	0.000	-

Significant relationship at *0.05

The dimensions were significantly positively correlated with each other. It was determined that there is a 76.2% positive relationship between Corporate Social Responsibility and Corporate Reputation. The results of regression analyses are given in Table 4.

Table 4: Result of Regression Analyses

Dependent Variable:	Coefficient	St. Error	t statistic	p
Corporate Reputation				
Constant	0.138	0.048	2.875	0.000*
Corporate Social Responsibility	0.762	0.121	6.297	0.000*
$R^2 = 0.771$ $F_{stat} = 25.11$ $F_p = 0.000$ Harvey test (p) = 0.126 LM test (p) = 0.253 Jarque-Bera (p) = 0.109				

Statistically significant variable for %5

As can be seen in the model results; the corporate social responsibility variable has a positive significant effect on the corporate reputation ($\beta=0.762$, $p<0.01$). Thus, the hypotheses H_1 were confirmed.

For the tests of the assumptions of the models, the normality assumption was first tested with the Jarque-Bera test and since $p>0.05$, the H_0 hypothesis indicating normal distribution was accepted. LM test was applied to test for autocorrelation and since $p>0.05$, the hypothesis H_0 , which states that there is no autocorrelation, is accepted. Harvey test was applied to test the heteroskedasticity problem and since $p>0.05$, the hypothesis H_0 indicating homoskedasticity was accepted.

Table 5: Result of Regression Analyses

Dependent Variable: Corporate Reputation	Coefficient	St. Error	t statistic	p
Constant	1.574	0.293	5.372	0.000*
Economic Responsibility	.373	.024	15.752	0.000*
Legal Liability	.132	.018	7.397	0.000*
Ethical Responsibility	.246	.027	9.221	0.000*
Volunteer Responsibility	.227	.021	10.613	0.000*
R ² = 0.683 F _{stat} =31.68 F _p =0.000 Harvey test (p) = 0.131 LM test (p)= 0.458 Jarque-Bera (p)=0.282				

Statistically significant variable for %5

As can be seen in the model results; the corporate social responsibility sub-dimensions has a positive significant effect on the corporate reputation. Economic responsibility has a positive effect ($\beta=0.373$, $p<0.01$), legal liability has a positive effect ($\beta=0.132$, $p<0.01$), ethical responsibility has a positive effect ($\beta=0.246$, $p<0.01$), volunteer responsibility has a positive effect ($\beta=0.227$, $p<0.01$) on corporate reputation. Thus, the hypotheses H_2 were confirmed.

5. Conclusions

In today's context, the influence of organizations is not solely determined by material factors, but also by the perception of the organization held by stakeholders, namely its reputation, which is increasingly gaining significance. The outcomes of the abstract concept of reputation can be considered as yielding tangible values in the long run. These values can be summarized as generating high profits, gaining societal recognition, cultivating loyal employees and customers, navigating crisis periods with greater resilience, attracting new investors, enhancing bargaining power, boosting competitiveness, and increasing the effectiveness of advertising efforts.

An organization can maintain and enhance its corporate reputation through the solutions it provides for social problems. Social responsibility is employed in a moral sense, implying that organizations and individuals should consider the welfare of society alongside their own interests. Through their social responsibility initiatives, institutions communicate to their environment that they are conscientious corporate citizens committed to societal well-being. This information presented to the environment affects the reputation of the organization in the long run.

This study aims to analyze the impact of corporate social responsibility perceptions among academicians in various positions at Istanbul universities on corporate reputation using regression analysis. The analysis conducted on a total of 879 academicians revealed a significant positive relationship of 76.2% between corporate social responsibility and corporate

reputation. On the other hand, positive and significant relationship was determined between economic responsibility, legal liability, ethical responsibility, volunteer responsibility and corporate reputation. Social responsibility activities in universities also have a significant impact on corporate reputation.

Universities are crucial institutions operating in the service sector, playing a decisive role in shaping a country's economic, technological, political, socio-cultural, and other future aspects. Attaining corporate reputation goes beyond the identity, image, and brand of the university; it is rather dependent on the performance indicators that lend significance to these concepts. The relevant performance indicators not only serve as the fundamental criteria for success rankings but also reflect the relative success and institutional reputation of the university.

There is a need to emphasize the development of a more effective measurement and evaluation system that considers all stakeholders within universities. It is crucial to introduce a competitive approach based on the institutional reputation management model in higher education as soon as possible. This approach should be presented as a distinctive reputation management model that can serve as a global benchmark for universities.

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Decarbonization of Transport and Energy Sector in the Perspective of a Climate Neutral Economy by 2050: The case of Poland

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Abstract

The aim of the paper is to investigate CO₂ emissions from transport and energy sector using available data. Additionally, this paper also aims to present possible scenarios of the reduction of CO₂ emissions for these two sectors. During the COVID-19 the business world has changed its attention to sustainability because of many pandemic problems. However, Regulation (EU) 2021/1119 of the European Parliament and of the Council of 30 June 2021, establishing the framework for achieving climate neutrality, is still a huge challenge for the reduction of GHG emissions. This is a landmark piece of legislation that sets out a comprehensive strategy for the European Union (EU) to reach net-zero greenhouse gas (GHG) emissions by 2050. The regulation sets out a number of measures to reduce GHG emissions, including also a commitment to reducing emissions in the transport and energy sector. Overall, the Regulation is also an important step towards achieving climate neutrality in the transport and energy sector by 2050.

It provides a comprehensive framework for decarbonisation and sets out binding targets for the reduction of GHG emissions. It also establishes a monitoring and evaluation system to ensure that these targets are met. In order to achieve climate neutrality, both transport and energy will be obliged to drastically reduce CO₂ emissions. The research results show that transport is the only sector in which carbon dioxide emissions have risen from 1999 year. Conducted analysis of scenarios indicate that transport will be mainly responsible for aching climate neutrality goals in Poland. It means that Poland should reduce CO₂ emissions in transport by about 60% by 2050 compared to 2005. Specifically, by 2050, emissions from passenger road transport should reach approximately 6.8 Mt CO₂, while freight transport should be around 6.4 Mt CO₂. In the energy sector achieving climate neutrality is technically feasible, but it requires a high financial cost. What is more, the majority of CO₂ emissions reduction in Poland is already taking place in the energy sector, but the role of this sector in the reduction effort will decrease over time. In one possible scenario the average emissions intensity of electricity production is significantly reduced from around 0.65 tCO₂ to slightly negative in 2050.

Keywords: environmental sustainability, transport, energy sector, decarbonization, neutrality

1. Introduction

A climate-neutral economy is one that has achieved net-zero greenhouse gas emissions (GHG), meaning that any emissions produced are offset by activities that remove carbon dioxide (CO₂) from the atmosphere, such as reforestation or carbon capture and storage. Achieving a climate-neutral economy is also a critical component of global efforts to address climate change and limit global warming to 1.5 degrees Celsius above pre-industrial levels, as outlined in the Paris Agreement (Delbeke, et al., 2019). The combustion of fossil fuels is still a major contributor to global CO₂ emissions (Quadrelli, & Peterson, 2007). In the EU, the energy sector and transport are the two main sectors responsible for greenhouse gas emissions (EEA, 2021).

Carbon dioxide, which constitutes 58% of the total global energy consumption derived from combustion processes, is regarded as one of the most crucial greenhouse gases. In the year 2021, emissions of CO₂ resulting from energy combustion and industrial activities represented nearly 89% of the total greenhouse gas emissions originating from the energy sector (EEA, 2022). In 2019, the global amount of CO₂ emissions resulting from the combustion of fossil fuels and related processes increased by 0.9%, which is only about half of the growth rate seen in the

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previous year (+1.9% in 2018). The global level of emissions in 2019 was 38.0 Gt CO₂ (Crippa, et al., 2020). Transportation constituted almost 34 % of total energy consumption and above 25% of total carbon dioxide (CO₂) emissions in 2018 (European Environmental Agency Database, 2020). Furthermore, transport is a significant emitter of greenhouse gases (Rehman, et al., 2023), which is responsible for approximately 75% of global CO₂ emissions (and for 70% of CO₂ in the European Union) (Zhang, et al., 2022). While there have been global reductions in pollutant emissions since 1990, the extent of these reductions varies between different modes of transport (Pyrka, et al., 2022). The ever-increasing need for transport is evident in the rise of traffic congestion and higher energy usage, leading to increased emissions (Edenhofer, et al, 2015). Although, the combined fossil CO₂ emissions of the EU27 and UK have seen a significant decline in the last twenty years, it remains a huge challenge for many European countries. Specifically, in 2019, they were 25% lower than in 1990 and 22% lower than in 2005. Moreover, the EU27 and UK's share of global emissions has also decreased, going from 9.6% in 2015 to 8.7% in 2019. However, despite these reductions, per capita emissions in the EU and UK were still higher than the global average, with 6.47 t CO₂/cap/yr in 2019. On the other hand, emissions per unit of GDP have decreased to 0.144 tCO₂/kUSD/yr, which is less than half of the global average (Crippa, et al., 2020).

Poland is one of the most significant economies within the European Union and heavily relies on fossil fuels. The country's emissions stem predominantly from four key sectors: transport, buildings, agriculture, and the energy industry (Kolasa-Wiecek, 2015). Coal, natural gas, and oil continue to be the primary sources of energy for Poland's power and transport sectors. Regrettably, Poland has been slow in embracing renewable energy, leading to substantial challenges in transitioning to a climate-neutral economy. Despite being slow to adopt renewable energy, Poland has started implementing a decarbonization strategy to transition towards a climate-neutral economy. Furthermore, the transport sector in Poland is a significant contributor to global greenhouse emissions, emphasizing the pressing need for decarbonization (Pyra, 2023). Therefore, it is imperative to scrutinize the decarbonization process within the Polish energy and transport sectors.

This article examines the process of decarbonizing the transport and energy sectors for achieving a climate-neutral economy in Poland. Thus, this paper investigates CO₂ emissions from transport and energy sector in the past and future perspective to presents possible scenarios of CO₂ emissions using available data.

The paper is structured as follows: Section II presents a brief review of decarbonizing the energy and transport sectors, as well as the contribution of these sectors to carbon emissions in Poland. Section III describes the data and methods used in this paper. Section IV analyzes scenarios for reducing GHG emissions in the energy and transport sector, focusing on the neutrality scenario. Section V discusses the findings, and Section VI demonstrates practical implications for policymakers and considers the limitations of the study. This section ends with directions for future research.

2. Literature Review

The decarbonization process is marked by various factors and uncertainties, which pose challenges in identifying a singular evolutionary trajectory. Scenario analysis enables the exploration of multiple potential pathways that facilitate the attainment of decarbonization objectives (Kolasa-Wiecek, 2015). Decarbonizing the energy and transport sectors has become a major focus in the global effort to reduce carbon dioxide emissions and mitigate the impact of climate change (Beccarelli, & Foggia, 2023). The two sectors are responsible for a significant portion of the world's CO₂ emissions. The matter of strategies and pathways to achieve decarbonization is presently one of the most intellectually stimulating topics in the

literature on energy and climate (Papadis, & Tsatsaronis, 2020). This is largely due to the Paris Agreement, which implores nations to take decisive measures to curtail the escalation of global temperatures. Given that a shift towards renewable sources of energy for the production of power, heat, and transport is a viable option on a global scale it is incumbent upon all stakeholders to participate in this endeavor (Bogdanov, 2021).

Poland is the largest producer of hard coal in the European Union, with approximately 90% of the country's electricity generation relying on this fossil fuel (Pietrzak, 2021). Thus, the Polish energy sector extremely depends on coal (Kaszyński & Kamiński, 2020). A high demand for coal contributes to the production of enormous emissions of chemical compounds into the atmosphere, of which CO₂ may account for about 92% (Dyjak, 2018). The age of power plants in Poland is evidence of such a large amount of emitted pollutants. The transformation of heavy industry, as well as a decrease in coal mining, certainly contributed to such a high percentage share. The largest share of CO₂ emissions come from fuel combustion - around 92%, of which as much as 50% come from the energy sector (Kochanek, 2021). Despite the active engagement of the Polish energy sector in reducing GHG emissions through a gradual reduction of the share of coal in the fuel mix and development of renewable energy sources, it encounters notable hurdles in meeting the objectives outlined in Regulation (EU) 2021/1119.

The transport sector is also a significant contributor to global CO₂ emissions. In Poland transport was responsible for 15% global greenhouse gas emissions in 2019 (Antosiewicz, et al., 2022). Referring to figure 1, it can be observed that from the baseline position in 1990 to 2020, CO₂ emissions from the energy sector in Poland were reduced by 54.5%. However, the reduction of CO₂ emission from transport are not observed significantly. In fact, Poland continues to experience a rising trend in carbon dioxide emissions in the transport sector. In figure 2, it can be seen that the CO₂ emissions in 2020 amounted to 7.71 t cap/yr, which is still higher than the global average of CO₂ emissions. However, the CO₂ emissions per unit of GDP decreased to 0.239t CO₂/kUSD/yr.

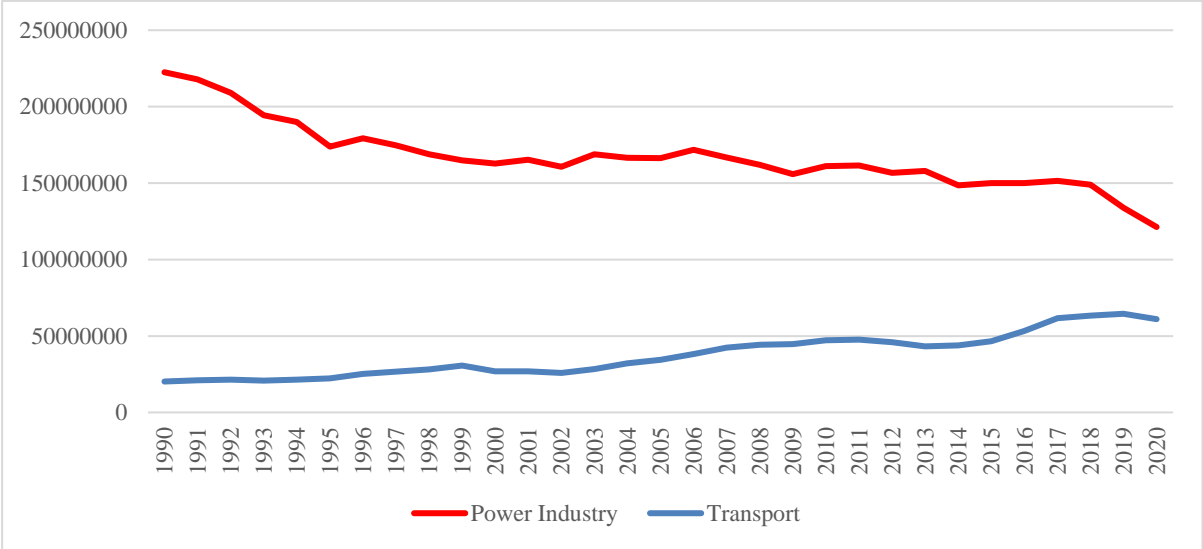


Figure 1: CO₂ emissions from transport and power industry in Poland in tons (1990-2020)

Source: own elaboration based on EDGAR-Emissions Database

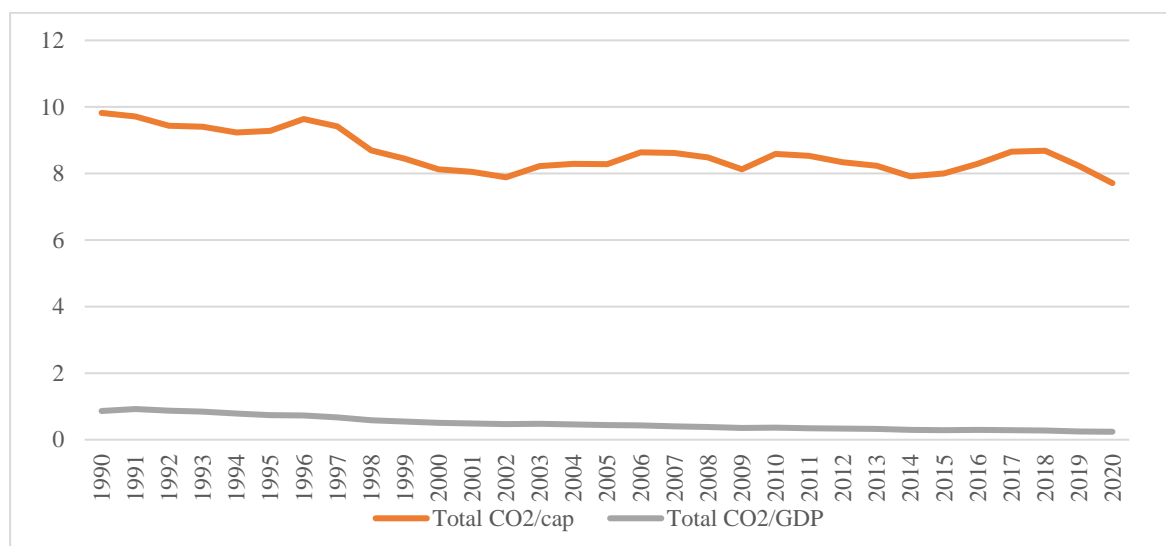


Figure 2: Total CO₂ emissions in Poland (1990- 2020) (total CO₂/GDP and total CO₂ /cap)

Source: own elaboration based on the World Bank database. World Development Indicators.

3. Data and Method

The methodological approach employed in this research primarily involves reviewing literature, mainly national reports describing the most realistic scenarios of the energy and transport transformation in Poland, quantifying the scenarios, and comparing them. This study also utilized secondary data sources that are publicly accessible from multiple sources. Firstly, the main data set comes from EDGAR-Emissions Database. The database provides detailed information on emissions at a country, regional, and even city level, and it covers a time period of several decades. Secondly, JRC IDEES database (IDEES- Integrated Database of the European Energy Sector) maintained by the Joint Research Centre (JRC) of the European Commission. It brings together all statistical data that are relevant to the energy system, combining the energy balances with macro-economic, demographic, activity (e.g. industrial output; mobility) and climatic data. In JRC-IDEES detailed information about CO₂ emissions and stock energy equipment can be find. Thirdly, the data from the European Agency database was collected too. The CO₂ emissions data in the EEA database can be used to track progress towards the EU's emission reduction targets, which aim to reduce emissions by at least 55% by 2030 compared to 1990 levels. The EEA database is provided at a local level, which allows for a more detailed analysis of emissions patterns and trends. Fourthly, The World Bank's World Development Indicators (WDI) as a comprehensive database which includes data on CO₂ emissions from various sectors, such as energy, industry, agriculture, and transport. It also includes data on CO₂ emissions per capita and per unit of GDP, which can help to assess a country's carbon efficiency. The national database, including the KOBIZE database and reports prepared by the National Centre for Emissions Management, was also used. The KOBIZE database and reports are provided by the National Centre for Emissions Management, which is a Polish government agency. KOBIZE is responsible for collecting and managing data on emissions from various sectors, including energy, transport, industry, and agriculture.

The frame of the study was set for mainly period from 1990 to 2020 based on available data. For the analysis of CO₂ emission reduction scenarios (BAU, REF, and NEU), two-time frames were set, from 2030 to 2050, compared to the base years of 1990 and 2005. Base Scenario (BAU) assumes a 60% reduction by 2050 compared to 1990, excluding the land use and forestry sector (LULUCF). Reference Scenario (REF) aims for a target reduction of approximately 80% of GHG emissions by 2050 compared to 1990, excluding LULUCF. Neutrality Scenario (NEU)

assumes approximately a 90% reduction in emissions by 2050 compared to 1990, reaching zero net emissions through the inclusion of carbon sequestration technologies, including LULUCF. In all scenarios (BAU, REF, and NEU), it was assumed that the electricity and heat sector would contribute sufficiently to achieving the reduction targets at both the national and EU levels. The analysis also included the following elements: a time horizon defined for the period 2015-2050, which encompasses a crucial period for assessing the impact of energy-climate policy and meeting the community goals for GHG reduction.

4. Econometric Analysis

4.1. Scenarios for Reducing GHG Emissions in the Energy and Transport Sector

The analysis of emission reductions in the transport and energy sectors has gained significant importance due to their large share of CO₂ emissions and the emergence of new technologies. Extensive research has been conducted on various measures and pathways for reducing CO₂ emissions (Meckling & Jenner, 2016). The importance of these two sectors in CO₂ emissions and the emergence of new technologies are the main drivers for recognizing the need for in-depth analysis. The main tool for achieving the goal of reducing GHG emissions is the implemented the European Union Emissions Trading Scheme (EU ETS system), which currently primarily covers energy-intensive sectors of the economy and energy production (Watanabe, & Robinson, 2005). The ETS system is one of the three flexible mechanisms commonly known as the "Kyoto mechanisms," namely Joint Implementation (JI), Emissions Trading (ET), and Clean Development Mechanisms (CDM). They provide developed countries with substantial flexibility and a structured approach to engage and support developing countries in meeting their commitments for reducing greenhouse gas (GHG) emissions (Cadez, et al., 2019). Furthermore, each country formulates its own development scenarios to identify feasible directions of development that support the formulated policy objectives (Snoek, 2003). Part of the GHG emissions is covered by the EU ETS system, where there is no division of reduction targets among member states. The remaining part of the GHG emissions is in the so-called non-ETS area and is not subject to a unified community reduction mechanism. Member states of the EU are responsible for emissions in the non-ETS area and implement national reduction targets agreed upon as part of the EU's effort sharing. This means that the GHG emission reduction mechanisms implemented in this area may vary between member states. As a result, the cost of reducing GHG emissions in the non-ETS area may differ. Additionally, considering different GHG reduction scenarios (baseline, reference, and neutrality), the costs of reducing CO₂ emissions for ETS sectors (energy) and non-ETS sectors (transport) can vary significantly. It is also worth mentioning that GHG the amount of non-ETS emissions in Poland is roughly equivalent to the amount of EU ETS emissions, while across the European Union, non-ETS emissions make up approximately 55% of total emissions.² In table 1 are presented various GHG reduction scenarios both for the EU and Poland. In the baseline scenario (BAU) and the reference scenario (REF), it is assumed that the legislation introduced as part of the European Commission's package will be implemented by 2030, as well as the greenhouse gas reduction target, which is to reduce EU emissions by at least 40% by 2030 compared to 1990. The neutrality scenario (NEU) is based on the revised EU climate policy and assumes an increase in the net reduction target for 2030 to at least 55% compared to 1990 emissions and achieving net-zero emissions by 2050. According to the neutrality scenario - NEU, it was established that the EU ETS sectors would reduce their emissions by 60% in 2030, without changing the scope of the EU ETS system. Meanwhile, non-ETS sectors would reduce their emissions by 40% compared to the 2005 level. The implemented burden-sharing between sectors also results from the relatively lower costs of reduction in the energy sector belonging

² <https://www.kobize.pl/en/article/non-ets/id/337/general-information>. Date of publication: 30.11.2018

to the EU ETS, compared to sectors covered by the non-ETS area (such as transport, agriculture, and the residential sector). In 2050, in the neutrality scenario, the reduction target for the EU ETS sectors was set at 93%, which corresponds to the emission reduction presented in the EC GECO2020 projection for the 1.5°C scenario. As a result of adopting a specified level of reduction for the EU ETS sectors, in order to achieve the assumed community reduction target of approximately 90% in 2050, the rest of the non-ETS economy sectors must reduce their emissions by 82% in 2050. Table 1 shows different GHG reduction scenarios for UE ETS and non-ETS sectors. It also presents the assumed emission reduction targets for Poland in non-ETS sectors: an 18% reduction for 2030 compared to the 2005 level, and an 73% reduction for 2050 compared to the 2005 level.

Table 1: GHG reduction scenarios for UE and Poland according to different scenarios (BAU, REF, NEU).

Scenario	EU ETS	Non-ETS	EU ETS	Non-ETS	Total	Total
	2030 vs. 2005	2030 vs. 2005	2050 vs. 2005	2050 vs. 2005	2030 vs. 1990	2050 vs. 1990
BAU	48%	30% (PL 7%)	69 %	47% (PL 31%)	42%	60%
REF	48%	30% (PL 7%)	83%	75% (PL 62%)	42%	80%
NEU	60%	40% (PL 18%)	93%	82% (PL 73%)	53%	90% (netto 100%)*

Source: own elaboration based on KOBIZE database. In parentheses are emission reduction figures for the non-ETS sector for Poland. Notes: * The achieved greenhouse gas (GHG) reduction target, taking into account the absorption in the LULUCF (Land use, land use change and forestry) sector and greenhouse gas removal technologies from the atmosphere (such as biomass combustion with CCS technology); PL- reduction emissions targets for Poland

4.2. Decarbonizing the Energy Sector in the Perspective of a Neutrality Scenario

To achieve climate neutrality (NEU scenario), the level of CO₂ emission reduction in the energy sector should be approximately 54 million tons of CO₂ in 2030 and approximately - 20 million tons of CO₂ in 2050. For the other two scenarios, the reduction of emissions should be - 11 million tons of CO₂ in 2050, and 87 millions tons of CO₂ in 2030 for the REF scenario, and approximately 87 million tons of CO₂ in 2030 and approximately 16 million tons of CO₂ in 2050 for the BAU scenario. As seen in figure 3 the process of carbon reduction in the energy sector will increase after 2030. This will be associated with the phasing out of outdated and currently used power blocks. The process will be influenced by the increase in costs related to the purchase of CO₂ emission allowances in old coal-fired units, which will likely accelerate the process of their decommissioning. During this period, the pace of development of renewable energy sources should also increase, as the decrease in their costs (with an increase in emission reduction technology costs) will increase their competitiveness. Poland has pledged to reduce the share of coal in its energy mix to 56% by 2030 and to completely phase out coal by 2049. The plan to achieve this involves investing in new technologies to reduce emissions from coal-fired power plants, as well as increasing the share of renewable energy in the energy mix. It is planned to achieve the objective of decarbonization by increasing the proportion of renewable energy sources to 23% of the energy mix by the year 2030. The renewable energy sources are expected to contribute to a reduction in carbon emissions from Polish the energy sector. To achieve this target of neutrality the implementation of offshore wind farms and incremental investments in solar power are needed. In figure 3, it can also be observed that Poland may achieve negative CO₂ reduction in 2040 in the neutrality scenario. However, it is necessary to establish a carbon capture and storage facility for coal-fired power plants, which would enable the country to continue to use coal while reducing carbon emissions. It will be related to the

BECCS (*BioEnergy with Carbon Capture and Storage*) technology for carbon capture and storage, as well as to industrial branches belonging to the EU ETS. Nonetheless, the pursuit of climate neutrality by 2050 necessitates substantial reduction of CO₂ emissions in the Polish energy sector. While such reductions are technically possible, they entail considerable financial investments due to the nature of the energy industry.

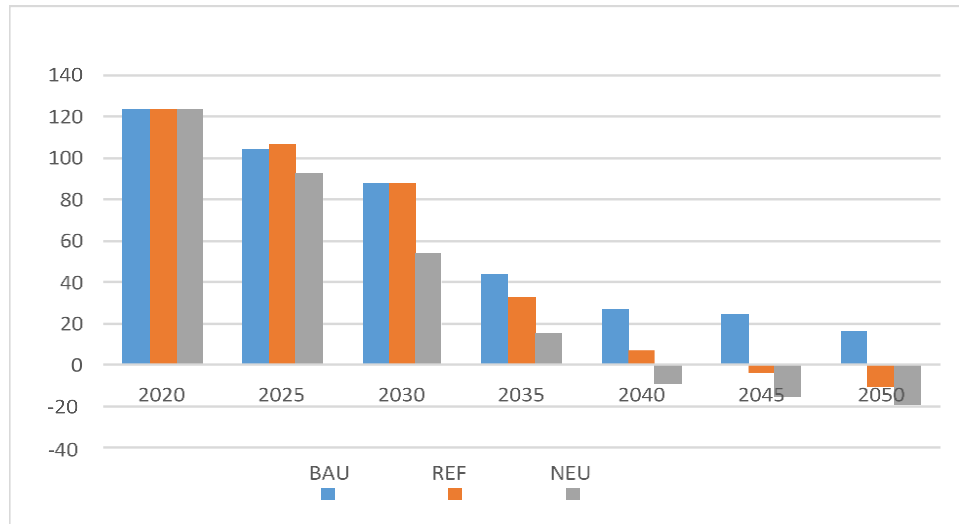


Figure 3: CO₂ emission in energy sector in Poland (in Mt CO₂) according to different scenarios (BAU, REF, NEU).

Source: (Pyrka, et al., 2021).

4.3. Decarbonizing the Transport Sector in the Perspective of a Neutrality Scenario

Poland plans to achieve reducing carbon emissions from the transport sector by 30% by 2030 and by approximately 60% by 2050 compared to 2005 through a combination of policies, including the promotion of electric vehicles, the improvement of public transportation, and the development of cycling infrastructure. In order to achieve climate neutrality, Poland should reduce CO₂ emissions in transport to 16 Mt CO₂ in 2050 according to the NEU scenario. The target for CO₂ reduction in 2030 is 52 Mt CO₂. Additionally, Furthermore, the REF scenario indicates a goal of 23 Mt CO₂ reduction in transport emissions by 2050, while the BAU scenario targets a reduction of 46 Mt CO₂ by the same year. Due to the reduction targets, reducing emissions in individual types of transport remains important (Figure 4).

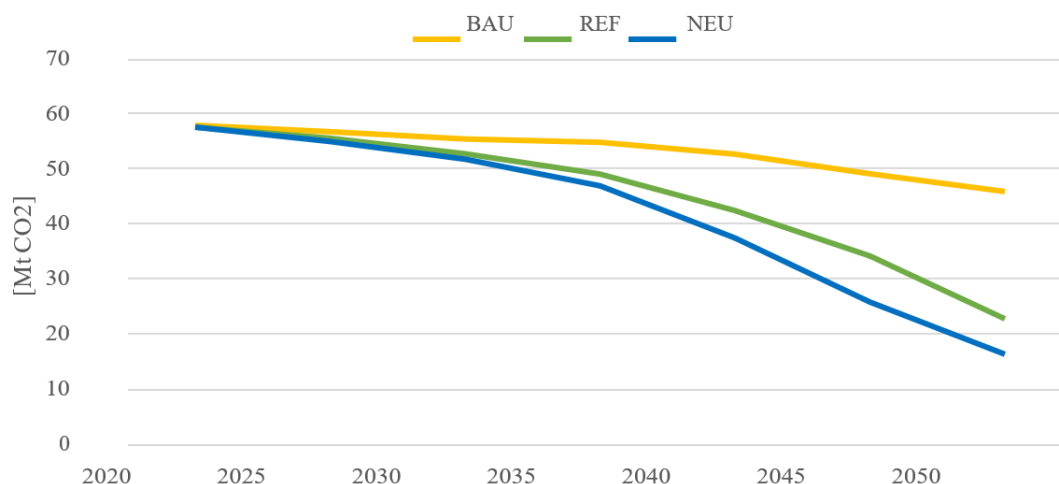


Figure 4: CO₂ emissions from the transport sector according to analyzed scenarios in Poland until 2050 (excluding emissions from electricity generation) [Mt CO₂].

Source: (Pyrka, et al., 2021).

It is predicted that achieving climate neutrality (NEU scenario) for transportation will require reducing the level of CO₂ emissions by approximately 52 million tons in 2030 and approximately 16 million tons in 2050. For the other two scenarios, the emission reductions should be approximately 23 million tons of CO₂ in 2050 and approximately 53 million tons of CO₂ in 2030 for the REF scenario, as well as approximately 46 million tons of CO₂ in 2050 and 55 million tons of CO₂ in 2030 for the BAU scenario (Table 2). Such reductions in transportation will also require significant emission reductions in various modes of transport. Thus, to achieve climate neutrality in passenger road transport, emissions should be at the level of approximately 6.8 million tons of CO₂ in 2050, and in freight transport, at the level of 6.4 million tons of CO₂. Emissions in aviation should be around 2.6 Mt CO₂. Climate neutrality in passenger road transport may be achieved through the electrification of the passenger car fleet. Table 2 also presents the number of electric passenger cars required to achieve neutrality in passenger transport. It shows that small differences between the REF and NEU scenarios in the number of electric passenger cars indicate that raising the reduction target in the NEU scenario will require more significant changes in other transport activities. Additional reductions will be achieved through the use of public transport, and in the case of freight transport. This would result in emissions from their use decreasing to 5.5 Mt CO₂ in 2050. Emissions from buses would also decrease from approximately 2.5 Mt CO₂ in 2020 to about 1 Mt CO₂ in 2050 as a result of both electrification and substitution of road public transport for railway transport. However, it should be considered that international mobility growth will increase demand for air transport by more than two times between 2020 and 2050. Despite increased activity in aviation, emissions remain at the same level, approximately 2 Mt CO₂ (Pyrka, et al., 2021). Such a result is achievable by reducing emissions intensity per passenger-kilometer, which will result from technological progress as well as the use of synthetic fuels.

Table 2: Reduction of emissions, and number of electric passenger cars in transport in Poland.

Scenario	2030	2050	2030	2050
	Emissions of CO ₂ Transport total*		Number of electric passenger cars [million units]	
	(Mt CO ₂)			
BAU	55	46	1.0	5.2
REF	53	23	2.3	13.4
NEU	52	16	2.4	14.0

Notes: * Including electricity demand [TWh]. Source: own elaboration based on (Pyrka, et al., 2021).

5. Discussion

Decarbonization has emerged as a profoundly thought-provoking area of focus within the realms of energy and climate policy. This paper examines the CO₂ emissions originating from the transport and energy sectors based on existing data. Furthermore, the objective of this study is to outline potential scenarios for reducing CO₂ emissions in both of these sectors.

The analysis of data indicates that the majority of emission reductions in Poland occur in the energy sector, but the role of this sector in the reduction effort diminishes over time. It means that climate neutrality can be mainly achieved through low-emission transformation of the transport sector in Poland. Pyrka, et al., (2021) confirm that significant portion of the reduction potential in the Polish energy sector will be utilized in the initial period, while in later years, the low-emission transformation must rely more heavily on costlier measures, including transportation. This goal will be achieved by reduction of CO₂ emission in passenger transport because private cars, in particular, are responsible for a significant share of these emissions. Generally, the literature also confirms that majority of CO₂ emissions reduction will take place

in the private cars road transport sector (Haasz, 2018). There exists a prevailing consensus amongst multiple authors that the production of greenhouse gases through road transport represents a notable hazard to the quality of urban air and contributes to the occurrence of global warming (Kok et al., 2011, Ong et al., 2011, Kopelias et al., 2020). Several authors have also discussed the potential for reducing CO₂ emissions in the private cars road transport sector to achieve neutrality. Most research studies show that reductions of GHG emission in transport may be achieved by a massive market and behavioral change (Haasz, 2018; Stanley, et al., 2011). According to Haasz's (2018) analysis, the private cars road transport sector accounts for the largest share of CO₂ emissions reduction (Haasz, 2018). Some commonly studied policies include encouraging the adoption of green automotive technologies, implementing vehicle and fuel standards, and introducing tax incentives or financial support measures (Sims, et al., 2014). AlSabbagh and Yusuf (2021) reviewed the policy landscape for decarbonizing road transport and found that policies such as fuel taxes, vehicle taxes, and subsidies for electric vehicles can effectively reduce emissions from the private car sector. They argue that policies need to be carefully designed to ensure they are equitable and do not disproportionately impact lower-income households. Sacchi, et al., (2022) also highlights the importance of supportive policies and regulations, along with the development of charging infrastructure, to facilitate the widespread adoption of electric vehicles. They postulate that transitioning to electric vehicles has the potential to significantly reduce carbon dioxide emissions and improve air quality, contributing to environmental sustainability goals. Furthermore, Hall et al. (2019) reviewed the impact of autonomous vehicles on cities and found that while they have the potential to reduce emissions by improving fuel efficiency and reducing congestion, their widespread adoption is not guaranteed to reduce overall emissions. Therefore, a combination of policies is needed to encourage people to switch to low-emission vehicles and reduce the overall demand for private cars. Ajanovic (2015) analyzed decarbonization options for road transport in Austria and found that a mix of policies, including increasing the share of electric vehicles, improving public transport, and promoting cycling and walking, could significantly reduce emissions in the private car sector. However, the author also notes that achieving neutrality will require significant changes in societal behavior and attitudes towards mobility.

6. Conclusion

The decarbonization of the transport and energy sectors in Poland represents a considerable challenge. It is a fundamental and imperative endeavor for the nation to attain its objective of a climate-neutral economy by 2050. The Polish government has established an ambitious objective of mitigating carbon emissions in the transport and energy sectors by 30% by 2030 and attaining carbon neutrality by 2050. In order to realize this goal, Poland has implemented a range of policies, such as augmenting the proportion of renewable energy in the energy blend and discontinuing the operation of coal-based power stations.

Notwithstanding, the phasing out of coal-fired power plants will be a complex and expensive process. To conform with the existing energy standards, emphasis must be placed on the pragmatic execution of carbon capture and storage technology, aiming to curtail CO₂ emissions from coal-based power production by 90% via absorption and storage. This further necessitates exploring alternatives in the realm of low-carbon nuclear energy and renewable energy sources, concurrently amplifying the system's capacity and energy efficiency (Žuk, 2023). However, conducted analysis show that the role of energy sector will decrease over time in reducing CO₂ emissions. This implies that a substantial proportion of the reduction potential in the energy sector is being exploited in the initial phase, while in subsequent years, the low-emission transformation will necessitate an augmented reliance on more expensive actions, such as transport or agriculture. Attaining carbon neutrality in the transport sector will also mandate substantial investments in public transport, the creation of cycling infrastructure, and the

promotion of electric vehicles, while simultaneously enhancing public transportation (including the development of new tram and bus lines and the improvement of existing infrastructure) and augmenting cycling infrastructure. Thus, a range of policies should be implemented to promote electromobility. It is worth mentioning that the electrification of the passenger car fleet and the promotion of electromobility require changing consumers' decisions when choosing a new car. This can be achieved through appropriately designed financial solutions, such as subsidies for loans and low-interest loans, as well as the availability of infrastructure, including quick charging stations.

Investment in the development of hydrogen fuel cell technology, which has the potential to be utilized in heavy-duty vehicles such as trucks and buses, will be also required for the attainment of climate neutrality. However, achieving a climate-neutral economy also presents significant opportunities for Poland. The development of new technologies such as offshore wind and hydrogen fuel cells could create new industries and job opportunities in the country. Additionally, incremental investments in public transportation and cycling infrastructure could improve the quality of life for citizens and reduce air pollution. Overall, achieving a climate-neutral economy by 2050 is an ambitious but necessary goal for Poland and the global community.

The conducted analyses also have practical implications. It is imperative for policymakers to acknowledge that investments in new technologies will be pivotal to tackle the pressing challenge of climate change. Achieving climate neutrality will require the formulation of policies that invigorate the adoption of low-emission vehicles, while simultaneously ensuring equitable outcomes and avoiding any disproportionate impact on vulnerable demographics. Furthermore, it is imperative for the government to establish a close collaboration with energy firms and local communities in order to facilitate a smooth and successful transition.

The research analyses also have their limitations. The conducted analyses of CO₂ emissions are limited solely to Poland. Additionally, they do not take into account the delays that may arise from political decision-making, as well as the technical difficulties of decarbonizing aviation and certain industrial sectors. As a future research direction, further analyses can be conducted on achieving climate neutrality in economically similar countries, such as the Visegrád Group countries.

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The Relationship between Sustainability and Gender Inequality: Evidence from the BRICS Countries

Funda H. Sezgin¹

Abstract

The unsustainable production and consumption model clearly underlies the growing inequalities and crises in global economies. Sustainable development is a model that does not jeopardize the ability to meet the needs of future generations while meeting today's needs, and that considers not only quantitative growth but also environmental and social sustainability. Gender inequality and its consequences, particularly the exacerbation of women's poverty, constitute a significant obstacle to countries in their pursuit of sustainable development goals and a better future. Eliminating barriers that hinder the transfer of women's knowledge, talent, and creativity to practical applications becomes crucial at this stage. This study aims to uncover the correlation between gender inequality and sustainability in the attainment of sustainable development goals for BRICS countries. According to Emirmahmutoglu and Kose (2011) causality test, bidirectional causality was obtained for the overall panel. On the other hand, on a country basis, unidirectional causality was obtained for India and China (SDI→GII), while bidirectional causality was determined for Brazil, Russia and South Africa (SDI↔GII).

Keywords: gender inequality, sustainability, panel causality test, BRICS

1. Introduction

Economies that attempted to fulfill infinite human needs with finite natural resources encountered significant challenges during the industrial revolution and subsequent processes. Rapid consumption growth has led to a narrowing gap between the self-renewal rates of natural resources and consumption rates, resulting in various issues, particularly energy, food, and water security (Alcamo et al., 2020). To address the growing global population and demands for well-being, the concept of sustainable development, incorporating environmental, economic, and social aspects, has gained prominence as an alternative to the unsustainable production and consumption model. The effectiveness of the United Nations' sustainable development approach, which aims to fulfill present needs while safeguarding the ability to meet future generations' needs and promoting intergenerational justice, hinges on decisive actions taken by countries in this regard (Dhar, 2018).

Unlike the traditional development approach focused on quantitative growth, it is evident that realizing the potential of the female population is essential for achieving sustainable development that encompasses both quantitative and qualitative advancements, considering socioeconomic and environmental dimensions (Juhn et al., 2014). Women, due to their societal position and roles, are disproportionately impacted by numerous challenges, including economic crises, conflicts, limited access to health and education services, and the effects of climate change (Klasen, 2018).

Based on a 2020 World Economic Forum report analyzing 146 countries, the global gender gap stands at 68%. The areas with the highest gender gap are political empowerment, with a gap of 23%, and economic participation and opportunity, with a gap of 58%. Access to education and health sub-indices exhibit relatively smaller gender gaps, with rates of 95% and 96% respectively (WEF, 2020).

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The United Nations Development Program declared the Sustainable Development Goals in 2015, highlighting the presence of global, supranational common problems that require attention and action. The sustainable global development goals, which are categorized under seventeen different headings, are tried to be made feasible with various strategies until 2030 with the acceptance of world leaders and to minimize the problems that need to be fought. Among the 2030 Sustainable Development Goals (SDGs) endorsed by 193 world leaders in 2015, three explicitly focus on eliminating women's poverty and gender discrimination (Bali Swain & Ranganathan, 2021). These; SDG 1 is "Ending all forms of poverty", SDG 5 is "Achieving gender equality and empowering women" and SDG 10 is "Reducing inequalities within and between countries". Ensuring justice and inclusive participation, which uphold the rights of all individuals equally, is key to achieving a sustainable life for both present and future generations.

2. Sustainability and gender inequality Relationship

Sustainable development, encompasses economic, social, and environmental development that promotes human well-being, dignity, ecological integrity, gender equality, and social justice both in the present and for future generations (Odera and Mulusa, 2020). The main goal of development is to meet human needs and expectations. The basic needs of many people in developing countries such as food, clothing, shelter and work cannot be met. These people have justified expectations for a good quality of life beyond their basic needs (Nilsson et al., 2018). A world where poverty and inequality are widespread will always be prone to ecological and other crises. Sustainable development necessitates meeting the basic needs of all individuals and providing everyone with the opportunity to achieve a higher life expectancy (Agarwal, 2018). The 2030 Agenda for Sustainable Development reaffirms the vital significance of gender equality and the universal consensus on its contribution to the attainment of all 17 Sustainable Development Goals (SDGs). Creating more employment opportunities for women, particularly in skilled positions, implementing universal measures to recognize, reduce, and redistribute unpaid care and household work, and ensuring social protection are crucial for effectively implementing the transformative sustainable development agenda (Hirsu et al., 2019). The 2030 Agenda for Sustainable Development aims to reduce poverty (Goal 1) and inequalities (Goal 10), achieve gender equality (Goal 5) and promote inclusive and sustainable economic growth, full and productive employment for all, and decent work (Goal 8).

Gender equality, on the other hand, refers to the equality of women and men in matters related to life. Gender equality recognizes the different needs and interests of men and women and requires a redistribution of power and resources (Jain-Chandra et al., 2018). The goal of this equality, sometimes called material equality, goes beyond equality of opportunity (European Institute for Gender Equality, 2016). It is acknowledged that women and men have distinct needs, preferences, and interests, and achieving equality of outcomes may necessitate tailored approaches for both genders (Kabeer, 2015). Gender equality implies honesty in processing for women and men according to their needs. This form of equality entails providing equal treatment that is different yet regarded as equivalent in terms of rights, benefits, obligations, and opportunities (Stotsky, 2016). Achieving gender equality often entails implementing specific measures to address women's historical and social disadvantages (European Commission, 2019). Gender equality encompasses a facet of social justice that addresses traditional, customary, religious, or cultural norms that often disadvantage women (Fan and Jafre, 2020).

The World Development Report of 2000 exhibits a more comprehensive approach towards achieving gender equality compared to the 1990 World Development Report. In this report, we see that gender issues are addressed in different components such as opportunities,

empowerment and security. At the 9th meeting of the United Nations Commission on Sustainable Development in 2001, world leaders highlighted the significance of energy in enhancing people's quality of life, underscoring the strong connection between energy services and the Millennium Development Goals (MDG)8 set in 2000.

Decisions taken at the World Summit on Sustainable Development held in Johannesburg in 2002 are; to increase the level of education of all people, especially girls, young and adult women, as a fundamental human right; to work at all levels, in all situations and in all areas throughout life, in order to ensure gender equality in education; to ensure equal participation of women and men in science and technology; to preserve and maintain cultural diversity and pluralism, with particular emphasis on women's rights; and to ensure equal participation of women in the media, information and communication technology (Dugarova, 2018; Caridade et al., 2022). In addition, emphasizing that energy is a vital factor for the achievement of MDGs, introducing gender perspectives into all policies and strategies based on gender equality basis; eradicating violence and discrimination against women and improving women's status, health and economic well-being through ensuring their access to economic opportunities, education and health care; equal access and full participation of women in all stages of decision-making mechanisms were called for (Kazandjian et al., 2016). The report notes that despite all these developments, gender analyses in sustainable development and environmental studies are still very poor.

The global development goals include women's right to life in the context of the demand for gender equality; the sharing of domestic roles in the context of labor and the valorization of domestic labor; combating glass-ceiling applications; the demand for equal pay for equal work; combating genital mutilation practices such as female genital mutilation in the context of reproductive and sexual health; having a say over the woman's body; early marriage and early birth; increasing visibility in the political establishment, in public spaces and promoting participation in decision-making mechanisms; access to property and inheritance rights; combating masculine laws in the context of legal regulations; national-legal improvements, social work practices and social policy regulations; access to information and communication technologies as one of the necessities of our time; and concrete regulations in areas such as digital literacy (Milazzo and Goldstein, 2019; Morgan et al., 2020; UN Women, 2020a).

3. Econometric Analysis

3.1. Purpose and Importance

Despite advancements in gender equality and women's empowerment, women and girls still encounter discrimination and violence in all regions of the world. When it comes to inequality, it is well known that women, who constitute half of the world's population, are still struggling with femicides and violence against women, which have become a global problem by being deprived of the right to life, which is still considered the most basic human right today, and with the usurpation of rights such as early and forced marriage. The global objectives aim to create a more sustainable and livable planet for people, considering both social well-being and minimizing damage to the climate, nature, and environment. The fifth objective of gender equality seeks to eradicate all forms of discrimination against women and girls, calling for an end to all violence and abuse targeting them. This study aims to explore the correlation between the sustainability index and the global gender gap index, focusing on how progress has been made regarding gender equality in sustainability initiatives within developing countries like BRICS.

3.2. Data and method

In the paper, the reciprocal relationship between gender inequality and sustainability development was examined through causality analysis. Gender inequality and sustainability development index were annual and covered 2010-2022 period. The symbols and definitions of the variables were shown in Table 1. The EViews 12.0 and Stata 15.0 were employed for the econometric analyses. The sample of the research composed of Brazil, Russia, India, China and South Africa (BRICS countries).

Table 1: Dataset Description

Variable	Definition	Data Source
GII	Gender Inequality Index	UNDP
SDI	Sustainability development Index	Sustainable Development Report

The causal relationship between economic freedom and educational attainment was analyzed with causality test of Emirmahmutoglu and Kose (2011). The test is the developed version of Toda-Yamamoto causality test for heterogeneous panels and takes the cross-sectional dependency into consideration. For this reason, the series are not required to be stationary for utilization of the test. In this context, Emirmahmutoglu and Kose (2011) causality test may be utilized with the series of I(0) and I(1).

Moreover, the test can be employed in existence of insignificant or significant cointegration interaction (Emirmahmutoglu and Köse, 2011). The causality between X and Y can be expressed as following:

$$Y = \varphi_Y^Y + \sum_{k=1}^{k_i+d_{max}^i} A_{11,ik} Y_{it-k} + \sum_{k=1}^{k_i+d_{max}^i} A_{12,ik} X_{it-k} + \mu_{Y,T}^Y \quad (1)$$

$$X = \varphi_Y^X + \sum_{k=1}^{k_i+d_{max}^i} A_{21,ik} Y_{it-k} + \sum_{k=1}^{k_i+d_{max}^i} A_{22,ik} X_{it-k} + \mu_{Y,T}^X \quad (2)$$

k is the lag length, d_{max} is the maximum integration level in both equations.

4. Empirical analysis

In the part of econometric analysis, pre-tests of crosssection dependence and homogeneity were firstly employed to make a selection among the tests of unit root and causality. In this context, the entity of cross-sectional dependence was analyzed by cross-section dependence tests of LM by Breusch and Pagan (1980), CD by Pesaran (2004), and LM adj. by Pesaran et al. (2008) and test' consequences were depicted in Table 3. The null hypothesis of cross-section independency was denied and in turn presence of cross-sectional dependence was concluded.

Table 3: Results of cross-sectional dependence tests

	Test Statistics	p
LM	15.673	0.007*
LM adj	12.908	0.000**
LM CD	13.426	0.001*

* %1 sig. level, ** %5 sig. level

The availability of heterogeneity was analyzed through delta tilde tests of Pesaran and Yamagata (2008) and test findings were shown in Table 4. As a consequence, null hypothesis of homogeneity was denied and presence of heterogeneity was concluded.

Table 4: Slope Homogeneity Test Results

	Test Statistics	p
$\tilde{\Delta}_{adj}$	12.674	0.000
$\tilde{\Delta}$	9.335	0.000

The availability of unit root in variables of GII and SDI was investigated via Pesaran (2007) CIPS test thanks to the presence of cross-sectional dependence and the consequences of unit root test were shown in in Table 5 pointed out that both GII and SDI were I(1). The results indicated that, GII was stationary at the first level, SDI was stationary after first-differencing.

Table 5: CIPS Unit Root Test Results

Variables	Pesaran's CIPS test
SDI	-1.178
∇LnSDI	-6.472*
GII	-0.963
∇LnGII	-8.223*

*stationary series for first order difference

Note: Pesaran (2007) p 281 for CIPS The critical value at 5% significance level in Table IIc = -2.813. The number of delays was determined according to the Schwarz Information Criteria. “Trend+constant” model has been studied.

Table 6: Results of causality test

Countries	SDI \nrightarrow GII		GII \nrightarrow SDI	
	Test Statistics	p	Test Statistics	p
Brazil	6.483	0.004*	8.412	0.004*
Russia	8.994	0.000**	6.047	0.000**
India	7.213	0.013*	1.262	0.213
China	12.603	0.009**	0.573	0.451
South Africa	17.435	0.027*	12.556	0.027*
PANEL	9.384	0.000**	10.329	0.000**

* %1 sig. level, ** %5 sig. level

The findings of cross-section dependence and homogeneity tests directed us to employ a causality test taking cross-section dependence and heterogeneity into consideration. Therefore, the causal relationship between GII and SDI was analyzed by means of Emirmahmutoglu and Kose (2011) and the findings of causality test were shown in Table 6.

The panel level causality analysis uncovered a bilateral causality between GII and SDI. However, the country level causality analysis discovered a bilateral causality between GII and SDI for Brazil, Russia and South Africa. On the other hand, a unidirectional causality from SDI to GII in India and China were discovered.

5. Conclusion

Although at first glance the concept of sustainability seems to have an ecological/environmental content such as climate change, recycling, renewable energy sources, continuity of plant and animal species and lineages, pollution/cleaning of the earth, it has actually expanded in a scope where its social/societal dimensions have become interesting at a significant level. Therefore, essential elements of sustainable development include social criteria such as equality, education, health, housing, and security (OECD (2018)). Since the early 2000s, the World Economic Forum and the United Nations Development Programme have been measuring the progress of gender equality, which is one of the seventeen key objectives of sustainability, using various indices.

Despite ongoing progress towards gender equality and women's empowerment, women and girls still confront discrimination and violence in all regions of the world. Gender equality is not only a fundamental human right, but also a necessary condition for a peaceful, prosperous and sustainable world (Youdell, 2005). Ensuring women and girls have equal access to education, healthcare, and participation in political and economic decision-making not only fosters sustainable economies but also benefits societies and humanity as a whole (Nieuwenhuis et al., 2018).

The concept of gender equality is widely recognized as a crucial tool for promoting sustainable development, peace, and security. The concept of gender equality signifies the provision of equal opportunities and the establishment of a balanced relationship between both sexes based on rights and responsibilities. It advocates recognizing the diverse perspectives, interests, needs, social roles, responsibilities, and priorities of women and men, and ensuring their equal representation in planning and decision-making processes (Pretorius and Nicolau, 2020). Moreover, since gender equality emphasizes the inclusion and active participation of women, who comprise half of the population, in economic production, it can be considered a fundamental requirement for achieving sustainable development.

This study aims to uncover the correlation between gender inequality and sustainability in the attainment of sustainable development goals for BRICS countries. According to Emirmahmutoglu and Kose (2011) causality test, bidirectional causality was obtained for the overall panel. On the other hand, on a country basis, unidirectional causality was obtained for India and China (SDI→GII), while bidirectional causality was determined for Brazil, Russia and South Africa (SDI↔GII).

When the concept of environmental justice, which is defined as ensuring the participation of everyone regardless of race, color, gender, nationality, ethnicity and income levels in the processes related to the preparation, enforcement and implementation of environmental laws, regulations and policies, and treating everyone fairly during the implementations, is evaluated, it is seen that environmental justice cannot be achieved without applying the gender highway strategy. In addition, it should not be forgotten that access to global resources is an important tool used when making socio-economic classifications. Because poverty is defined as the deprivation of resources that people will use to meet their basic needs. Gender-based data indicates that approximately 70% of the 1.3 billion people residing in developing countries are women, who often bear the responsibility of accessing natural resources to fulfill the needs of their families. As a result, women are disproportionately affected by environmental issues such as water scarcity and unproductive lands compared to men. When considered within the

framework of a holistic approach, it would be correct to base the analyses to be made on issues that require a serious paradigm change, such as quality of life and human dignity, on indicators related to environmental and social justice, gender equality, cultural values and religious beliefs. It should also be noted that women's empowerment is directly related to the success of environmental and resource management.

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The Relationship between Renewable Energy and Carbon Footprint: Evidence from Türkiye

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Abstract

To achieve sustainability, consumption of renewable natural resources must align with nature's production capacity during the same timeframe. The goal of sustainable development is to avoid surpassing the rate at which resources can be replenished. The green economic transformation, known as a low-carbon economy, aims to enhance both environmental protection and competitiveness by promoting cleaner production and eco-efficiency across various sectors. Achieving a green economy relies on the increased utilization of renewable energy sources. Green economy is a low carbon economy. Green energy encompasses the use of renewable energy sources rather than conventional electricity sources for energy provision. Renewable energy sources are clean and environmentally friendly. Green energy is then wind, water, geothermal, biomass, geothermal, biomass and solar energy, all of which have low carbon emissions. The aim of this study is to determine the relationship between renewable energy (RES) and carbon footprint (CO₂) for Türkiye. Both long-term and short-term significant relationships were obtained between RES and CO₂. As a result of cointegration, RES variable had a negative effect on the CO₂ variable and a 1% increase in RES decreased the CO₂ by 8.45%. As a result of error correction model, the impact of RES on CO₂ was revealed to be smaller in the short term than the one of long term.

Keywords: carbon footprint, renewable energy, cointegration analysis

1. Introduction

Rising human population has led to increased resource consumption, energy demand, and reliance on fossil fuels, resulting in ecological imbalance, heightened greenhouse gas emissions, and global warming. Countries worldwide are striving to come together, analyze, evaluate, and implement methods to address and mitigate the effects of global warming (Apergis et al., 2018). In alignment with these efforts, ongoing improvement initiatives are being undertaken to quantify carbon emissions from energy-consuming activities and products, aiming to reduce emissions through enhanced energy efficiency (Wang et al., 2016).

Today, energy affects all people as an increasingly important concept. The global emphasis on the concept of "sustainable development" has highlighted the importance of transitioning to clean and renewable energy sources (such as solar, wind, biomass, and geothermal) and promoting efficient production and consumption of conventional energy resources while minimizing environmental impacts (Xu and Buyya, 2020). The challenges of global warming and environmental pollution, stemming from the extensive reliance on fossil fuels to meet growing energy demands, coupled with the forecasted depletion of fossil fuel reserves, have spurred widespread adoption of renewable energy initiatives (Hu et al., 2021).

Ensuring consistent and reliable energy services that alleviate poverty, cater to the development needs of a growing global population, and simultaneously mitigate global climate change is among the foremost imperatives of our era (Chen et al., 2020). The excessive accumulation of greenhouse gases in the atmosphere, surpassing its natural cycle, has resulted in an uncontrollable global climate crisis. Eradicating the climate crisis must be the highest and most prioritized global initiative (Cosmas et al. 2019). The pursuit of new energy sources should be

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pursued through well-calculated and planned transformations, rather than relying on traditional methods that cause environmental harm. A sustainable and just world will only be possible if ecology and economy are reconciled (Dehnavi and Haghnejad, 2012).

Renewable energy technologies impact the environment less than fossil energy technologies. This is because the energy source is inexhaustible. While other energy sources are finite and limited, renewable energy sources are inexhaustible (Maalej and Cabagnols, 2020). The majority of renewable energy investments are allocated towards materials and labor for constructing the plants, rather than being directed towards expensive energy imports. Investments in renewable energy foster regional development, generate employment opportunities, and contribute resources to local economies (Vidyarthi, 2013). Renewable energy sources have the potential to fulfill a substantial portion of the world's energy requirements, offering advantages such as environmental enhancement, enhanced fuel diversity, national security, and regional economic growth (Nguyen and Kakinaka, 2019).

Environmental challenges cannot be resolved solely through individual or small-scale renewable energy projects. When prioritizing projects, it is important to consider their potential for replication at the local, national, regional, or global level. Adopting renewable energy approaches can aid in reducing deforestation, fostering afforestation, mitigating environmental impacts from energy infrastructure, and lowering greenhouse gas emissions.

Carbon footprint is basically the amount of greenhouse gases emitted into the environment as a result of individuals' daily activities. In other words, the definition of carbon footprint can be made as a measure of the damage caused by human activities to nature in terms of carbon dioxide (Riti et al., 2017). Therefore, carbon footprint calculation varies from individual to individual and there is always a measurable equivalent. Various human activities, including food consumption, vehicle technology, energy resource usage, financial choices, waste management, and travel, contribute to the carbon footprint individuals leave on nature (Lin and Raza, 2019). One of the most important factors that increase the carbon footprint is energy. The transition to renewable energy will therefore significantly reduce greenhouse gas emissions (Danish et al., 2019).

The global adoption of low-carbon economy policies is leading to a gradual increase in the utilization of renewable energy sources worldwide. The share of renewable energy sources doubled between 1970 and 2002, reaching 5.7% per year, with incentives to increase this share in International Energy Agency (IEA) countries. This share is expected to reach 60% by 2030.

2. Renewable Energy

Renewable energy refers to the energy derived from ongoing natural processes that involve continuous energy flow. Today, 80 percent of global energy comes from fossil fuels. Renewable energy sources play a critical role in reducing reliance on fossil fuels like coal, oil, and natural gas. Renewable energy sources include solar, wind, biomass, geothermal, hydro, hydrogen, and ocean energy (wave and tidal) (Chontanawat, 2020a). Renewable energy sources refer to resources such as the sun, water, wind, waves, etc., which are used to generate energy and can be replenished before being depleted. Renewable energy sources are derived from natural resources and are sustainable (Farhani and Shahbaz, 2014). Renewable Energy Sources can be listed as follows:

- Solar Energy
- Wind Energy
- Biomass Energy
- Geothermal Energy

- Hydroelectric Energy
- Hydrogen Energy
- Wave Energy

Solar Energy: The Sun is the source of energy for all the planets in the solar system. It is an indispensable resource, especially for all living things in our world. Solar panels are considered one of the most significant renewable energy sources today, particularly due to their convenience during summer months and their ability to substantially reduce electricity bills (Gill et al., 2018). Solar energy technologies collect the sun's rays to generate heat or electricity. Solar energy is utilized in the form of light, heat and electricity. Solar energy systems directly convert the captured energy into electricity and can be installed on rooftops of buildings, appliances, and even vehicles (Chen et al., 2019). Concentrated solar power plants utilize mirror and lens assemblies to concentrate solar radiation onto a small area, enabling the generation of electricity or heat.

Wind Energy: The source of wind energy is actually solar energy. Since solar energy does not heat land and sea at the same rate, the pressure difference creates wind. Wind turbines, installed in areas with strong wind, initially convert the kinetic energy of the wind into mechanical energy, which is then further converted into electrical energy (Adedoyin et al., 2020). The energy harnessed from wind depends on the velocity of the current wind and the duration of its blowing. Wind energy currently meets 2% of the world's electricity demand. Wind turbine technologies have a significantly lower environmental impact compared to other electricity generation methods (Wang et al., 2016).

Bioenergy / Biomass Energy: Renewable energy, such as wind energy, is considered an abundant and universally accessible source of energy. It is particularly valuable for rural areas, as it supports socio-economic development and is seen as a suitable and significant energy source (Danish et al., 2019). Biomass energy sources include specially cultivated plants like corn and wheat, grasses, algae, marine algae, animal manure, agricultural residues, and organic waste from households (such as fruit and vegetable scraps) (Zafar et al., 2019). As fossil fuel reserves diminish and concerns over environmental pollution grow, the utilization of biomass is gaining increasing significance as a solution to the energy challenge.

Geothermal Energy: Geothermal means ground heat. Water, primarily through natural events and precipitation, can infiltrate the Earth's crust via cracks, eventually reaching the magma layer. These heated waters in the magma layer reach the earth as hot water and steam (Adekoya et al., 2021). The water and steam that reach the Earth's surface can be harnessed to generate various forms of energy, thanks to turbines. Geothermal energy refers to the thermal energy stored within the Earth's crust. Power plants extract this energy to the Earth's surface and convert it into electrical energy (Goldstein and Hiriart, 2012). Geothermal energy can also be utilized in central heating and cooling systems for residential and commercial buildings, as well as in various physical therapy centers and tourist destinations favored by patients.

Hydroelectric Energy: Hydroelectric energy involves harnessing the power of flowing water and converting it into electricity. Hydroelectric power plants are renewable. They are a clean source of energy for nature (Sternberg, 2008). Power plants utilizing hydroelectric energy are particularly advantageous in regions with higher elevations, as the water flow rate tends to be greater in such areas. Hydroelectric power plants, relying on the energy of flowing water, serve multiple purposes including enhancing fisheries, enabling transportation, facilitating irrigation, and, significantly, generating energy (Raadal et al., 2011).

Hydrogen Energy: The limited widespread use of hydroelectric power is primarily due to the current technology and the challenges associated with its production. With technological

advancements, hydroelectric power has emerged as a leading contender to meet the world's energy demands as a clean and sustainable energy source. In the future, hydrogen energy will be used to generate electricity, heat and fuel cells (Bento and Moutinho, 2016).

Wave/Ocean Energy: We can actually think of the oceans as two separate sources of energy. The first is thermal energy from solar heat and the second is mechanical energy from waves and tides. The oceans, which cover 70% of the Earth's surface, are also the world's largest solar collectors (Adekoya et al., 2021). The temperature difference between the overheated water at the surface of the oceans and the cooler water at depth creates a natural thermal energy. Even a small fraction of this energy is enough to meet the energy needs of the entire world, if it is adequately utilized (Zhang et al., 2021).

3. Econometric Analysis

3.1. Data and Econometric Methodology

Data on total renewable energy supply and per capita CO₂ emissions are provided by the International Energy Agency (IEA). Analyzes were performed for the years 1990 to 2021.

Table 1: Dataset Description

Variable	Definition	Data Source
RES	Renewable Energy Supply	International Energy Agency (IEA)
CO ₂	CO ₂ Emissions Per Capita	International Energy Agency (IEA)

Table 2: Descriptive Statistics of RES and CO₂

Statistics	Renewable Energy Supply(RES)	CO ₂ Emissions Per Capita(CO ₂)
Mean	542094.9375	3.4156
Std. Deviation	203255.28953	.75139
Minimum	391098.00	2.30
Maximum	1074840.00	4.70
Median	451537.5000	3.3500

In the econometric analysis, first the stationarity of the series was analyzed by ADF (Augmented Dickey-Fuller) unit root test of Dickey and Fuller (1981) PP (Phillips-Perron) unit root test of Phillips and Perron (1988). Then the presence of cointegration relationship between two series was investigated by Johansen (1988) cointegration test and the cointegration coefficients were estimated by way of FMOLS (Fully Modified Ordinary Least Squares) estimator. Lastly, the short-run interaction between two series was analyzed by vector error correction model.

3.2. Empirical Analysis

In the empirical analysis, the stationarity of the variables was firstly examined for both constant and constant+trend. The stationarity of the two series was checked through ADF unit root test by Dickey and Fuller (1981) and PP unit root test of Phillips and Perron (1988) and the findings were displayed in Table 3. The unit root analysis revealed that two series were I(1).

Table 3: Results of ADF and PP Unit Root Tests

Variables	ADF		PP	
	Constant	Constant+ Trend	Constant	Constant+Trend
RES	-0.825(0.146)	-1.032(0.151)	-1.112(0.167)	-1.284(0.155)
d(RES)	-8.583(0.000)*	-9.101(0.000)*	-8.705(0.000)*	-9.104(0.000)*
CO2	-1.105(0.128)	-1.324(0.138)	-1.285(0.126)	-1.310(0.142)
d(CO2)	-6.944(0.013)*	-7.803(0.000)*	-7.214(0.000)*	-8.227(0.000)*

* indicates that it is significant at 5% significance level

Note: The values in parentheses are probability values.

The optimal lag length was determined for the cointegration analysis through unrestricted VAR model and the findings were displayed in Table 5. We took the optimal lag length as two considering information criteria.

Table 4: Determination of Optimal Lag Length

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-412.5175	NA	0.067058	5.811434	5.873591	5.836691
1	-399.6130	25.08709	0.063497*	5.756825*	5.005455*	5.657856*
2	-391.4292	15.56636	0.064238	5.768241	6.203344	5.945046
3	-386.0484	10.00911	0.067604	5.818858	6.440434	6.071437
4	-381.0507	9.086621	0.071555	5.874835	6.682884	6.203188
5	-378.3669	4.767082	0.078267	5.963173	6.957695	6.367299
6	-366.8238	20.01874	0.075677	5.927606	7.108600	6.407506
7	-361.9957	8.170757	0.080436	5.985953	7.353420	6.541626
8	-360.4028	2.628807*	0.089529	6.089549	7.643489	6.720996

*indicates the optimal lag length. LR (sequential modified LR test statistic), FPE (final prediction error), AIC (Akaike information criterion), SC (Schwarz information criterion), HQ (Hannan-Quinn information criterion)

The autocorrelation problem was checked by LM test and the heteroskedasticity problem was checked by Breusch-Pagan-Godfrey test in the model and no problems of autocorrelation and the heteroskedasticity were discovered in the model. Then, the cointegration relationship among RES and CO2 was analyzed by Johansen cointegration test and the test results were displayed in Table 5. The calculated trace and max-eigenvalue statistics were found to be higher than the critical values. Therefore, we revealed a cointegration relationship at 5% significance level.

Table 5: Johansen Cointegration Test Results

Unrestricted Cointegration Rank Test (Trace)				
Hypotheses	Eigenvalue	Trace Statistic	5% Critical Values	Probability Values
None *	0.228433	40.12665	15.49471	0.0000
At most 1	0.013547	2.004954	3.841466	0.1568
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				

Hypotheses	Eigenvalue	Max-Eigenvalue Statistic	5% Critical Values	Probability Values
None *	0.228433	38.12169	14.26460	0.0000
At most 1	0.013547	2.004954	3.841466	0.1568

The cointegration coefficients were given by normalized equation coefficients in Table 6. The cointegration coefficient revealed that RES variable had a negative effect on the CO2 variable and a 1% increase in RES decreased the CO2 by 8.45%.

Table 6: Normalized Cointegration Coefficients

DLog(CO2)	DLog(RES)
1.00	-0.0845*

*It is significant at 5% and the value in paranthesis indicates the standard error

The short run interaction between RES and CO2 was analyzed by VECM (Vector Error Correction Model) and the findings were displayed in Table 7. The error correction term was found to be negative and statistically significant. In other words, the error correction model works. 48.4% of the short-term deviations between the series that moved together in the long-term disappeared and the series converged to the long-term equilibrium value again. In other words, the effect of a shock to the system would be eliminated in $1/0.484=2.28$ days later.

Table 7: Results of Short Run Error Correction Model Estimation

Dependent variable: ΔLogCO2_t	Coefficient	Standard Error	t statistic	Probability Values
ΔLogRES_t	-0.046	0.009	-5.112	0.000*
ECT_{t-1}	-0.438	0.047	-9.319	0.000*
Constant	2.674	0.427	6.262	0.000*
<p><i>Diagnostic tests:</i> $R^2=0.612$, $\text{Adj. } R^2=0.609$, $F\text{-Statistic}=28.41$, $F\text{-Statistic } (P)=0.000^*$, <i>Breusch-Godfrey LM Test</i> (p)= 0.153* <i>White Test</i> (p)=0.120* <i>Ramsey RESET Test</i> (p)= 0.116* <i>JB test</i> (p)=0.283</p>				

Note: * indicates that it is significant at 5% significance level.

JB indicates the probability value of Jarque-Bera normality test.

The short-term coefficient value was obtained smaller than the long-term coefficient value. So, the impact of RES on CO2 was revealed to be smaller in the short term than the one of long term.

4. Conclusion

Encouraging the use of renewable energy can be achieved by implementing requirements or providing subsidies for energy companies, urging them to prioritize renewable energy in their targets and investments. Investors should adhere to strict policies regarding duration, quantity, and pricing to facilitate their path with the purchase guarantee. By doing so, it is possible to eliminate the initial investment cost and overcome the economic disadvantage associated with the utilization of advanced technology. Implementing a renewable energy policy enhances

economic competitiveness and mitigates ecological damage caused by irreversible global warming. Supporting energy efficiency and promoting the effective and prudent utilization of energy are crucial measures to reduce carbon emissions.

The aim of this study is to determine the relationship between renewable energy (RES) and carbon footprint (CO₂) for the period 1990-2021 for Türkiye. Both long-term and short-term significant relationships were obtained between RES and CO₂. As a result of cointegration, RES variable had a negative effect on the CO₂ variable and a 1% increase in RES decreased the CO₂ by 8.45%. As a result of error correction model, the impact of RES on CO₂ was revealed to be smaller in the short term than the one of long term.

To achieve sustainable growth and development, the Turkish economy should focus on harnessing its domestic resources for energy production. Ensuring sustainable development relies on the significant utilization of renewable energy resources, both for primary energy supply and electricity generation. The energy production program outlined in the Tenth Development Plan was specifically designed to prioritize the utilization of domestic resources. The objective of this program is to decrease reliance on external sources of energy by enhancing the contribution of domestic resources to energy production.

Türkiye should raise its strategic target for renewable energy in electricity generation to surpass 30% while simultaneously reducing reliance on fossil fuels. To boost incentives for clean energy, stronger legal arrangements should be established to support the efficient utilization of renewable energy sources beyond hydroelectric power. Incentives for renewable energy in Türkiye, especially solar and wind energy, are very low compared to European countries. In addition, research and development on clean energy technologies should be increased.

Enhancing the contribution of renewable energy sources to the energy supply will contribute significantly to environmental sustainability, reduce external dependency, and foster a high level of environmental friendliness. Mitigating risks associated with imports requires the diversification of energy sources, such as solar, wind, and geothermal, to ensure a more resilient energy sector. Formulating climate and energy policies in tandem is crucial for developing long-lasting solutions to address environmental challenges effectively. The harmonization of low-carbon investment policies with ministerial development policies is essential for effectively combating climate change.

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Investing in Employee Well-being: The Key to Retention in the Hospitality Industry During the Post-COVID-19 Era

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Abstract

This study examines the relationship between high-performance work practices (HPWPs) and employee retention in the hospitality industry. A survey was conducted among 1319 hotel employees in Jordan, resulting in a high response rate. The data were analyzed using various statistical methods, including descriptive, linear regression, hierarchical regression, and Macro-process-plugin analysis. The analysis showed that HPWPs have a direct impact on employee retention and an indirect effect on employee well-being and psychological capital. Furthermore, it is the first study to identify employee well-being and psychological capital as a moderated mediation mechanism between HPWPs and employee outcomes in tourism and hospitality. The paper presents significant theoretical contributions, practical implications, and recommendations for the industry, particularly during the post-COVID-19 era.

Keywords: employee retention, employee well-being, HPWPs, hospitality industry, Jordan, psychological capital, post-COVID-19

1. Introduction

In the contemporary era of the globalized economy and pandemics, organizations encounter critical challenges in recruiting and retaining highly skilled and talented employees (Govaerts et al., 2011; Pittino et al., 2016). These challenges are particularly pronounced in the hospitality sector, which scholars have scrutinized extensively (Deery & Shaw, 1997; Davidson et al., 2010; Bharwani & Butt, 2012; Bibi et al., 2018). An overall strategy employed by companies to enhance their attractiveness is incorporating high-performance work practices (HPWPs) into their human resource management strategies. HPWPs represent an interdependent set of human resources practices functioning cohesively to augment organizational performance (Alatailat et al., 2019; Tawk, 2021). The HPWPs framework encompasses three main domains: high employee involvement practices, human resource practices, and reward and commitment practices (Sung & Ashton, 2005). A substantial body of empirical research has confirmed the positive association between HPWPs and organizational performance (Combs et al., 2006; Shin & Konrad, 2017; Garg, 2019; Hauff et al., 2020; Gong et al., 2013), as well as employee outcomes such as job satisfaction and positive psychological health (van de Voorde et al., 2012).

Nevertheless, the potential benefits and drawbacks of HPWPs have been extensively debated in the literature, with contrasting views on their efficacy and appropriateness for different organizational contexts (Ogbonnaya et al., 2017). While some studies have demonstrated the positive impacts of HPWPs on organizational outcomes, there is evidence that HPWPs can also result in adverse consequences for employee health and well-being, leading to negative long-term effects for organizations (Kroon et al., 2009). The HPWPs model has been criticized as exploitative, adopted by organizations seeking to maximize their performance at the expense of employee health and well-being (Ramsay et al., 2000). At a practical level, organizations

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implement HPWPs to enhance their competitiveness in the market, expecting their employees to exert additional effort and accept more tasks as a result of this investment. This creates a more stressful work environment (Godard, 2001), leading to increased job strain (Ramsay et al., 2000) and leaving employees feeling unable to meet all their job requirements, known as "work intensification" (Godard, 2001; Kroon et al., 2009; Jensen et al., 2013).

The existing literature needs a consensus on the effects of high-performance work practices (HPWPs) on employee attitudes and well-being. While some studies suggest that HPWPs may have adverse effects on employee well-being (EmpWB) and health (Kroon et al., 2009; Ramsay et al., 2000), other research has shown that the negative impact of HPWPs can be mitigated by individual factors such as personal resources (Gong et al., 2013; Luthans et al., 2007a). Therefore, this study aims to contribute to this emerging debate by exploring the potential moderating role of personal resources i.e., psychological capital (PsyCap) in the relationship between HPWPs and employee well-being (EmpWB).

Psychological capital (PsyCap) is a personal resource that comprises positive psychological states, including self-efficacy, hope, optimism, and resilience (Luthans et al., 2007a). According to Luthans and Youssef (2004), PsyCap can be developed through interventions and training, suggesting that organizations enhance employee well-being by promoting the development of PsyCap. Individuals with high levels of PsyCap are better equipped to cope with their jobs' mental, physical, and psychological demands.

Several studies have supported the role of PsyCap in mitigating the harmful effects of job burdens on employee well-being. For example, a study by Avey et al. (2009a) found that PsyCap moderated the relationship between job demands and burnout. Similarly, a study by Kim et al. (2021) demonstrated that PsyCap enhances employees' abilities to meet their jobs demand and improve their performance. These findings suggest that individuals with higher levels of PsyCap are more resilient and better equipped to deal with the adverse effects of job demands, including those associated with HPWPs. In addition, organizations can derive significant advantages from these unique resources, as they complement organizational resources in enhancing employee well-being (EmpWB), performance, and attitude. Therefore, we propose that the impact of HPWPs on EmpWB and employee attitudes, such as employee retention (hereinafter referred to as EmpRet), is contingent upon the level of PsyCap possessed by employees. Specifically, PsyCap has the potential to amplify the positive effects of HPWPs on EmpWB and EmpRet. Research that attempts to evaluate the moderating impact of PsyCap on a behavioral outcome such as turnover intention is immensely needed (Gupta & Shaheen, 2017). PsyCap is a growing area of research, and a study that tries to analyze the moderating effect of PsyCap on a behavioral outcome such as turnover intention has been exceptionally needed, especially in the hospitality sector (Obeng et al., 2021).

The Ability-Motivation-Opportunity (AMO) framework (Appelbaum et al., 2000; Lepak et al., 2006; Miao et al., 2021), job demand resource theory (JD-R) (Bakker et al., 2005), and social exchange theory (SET) constitute the theoretical foundation of this study. The AMO framework is a well-established framework in the HPWPs literature (Miao et al., 2021), while JD-R and SET are widely used models in the literature on employee well-being (EmpWB) and attitudes (Bakker et al., 2005).

Drawing on the AMO framework, we contend that when employees possess the ability, motivation, and opportunity to utilize their capabilities, they become more engaged and experience higher levels of well-being. The JD-R model proposes that each job has two facets: job demands and job resources (Bakker et al., 2005). Job demands refer to physical, social, or organizational components of a job that require sustained physical and mental effort and are associated with physiological and psychological outcomes. In contrast, job resources refer to

physical, psychological, social, or organizational components necessary for meeting job responsibilities, facilitating workers' career and development, and enabling them to effectively cope with the physical and mental pressures of their jobs.

This study draws on the JD-R model and SET to investigate the potential moderating role of PsyCap in the relationship between HPWPs and EmpWB and EmpRet. We argue that HPWPs, as a job resource, may facilitate employees' job engagement and well-being, while PsyCap may amplify the positive effects of HPWPs on employee outcomes. In summary, this study proposes that HPWPs may enhance employee well-being and attitudes when employees possess the necessary personal resources to cope effectively with job demands, as suggested by the AMO framework, JD-R model, and SET.

The present study posits that high-performance work practices (HPWPs), as contextual resources, provide employees with the necessary resources to enhance their job-related abilities, motivation, and opportunities, thereby promoting elevated levels of employee well-being (EmpWB). These resources include training opportunities, decision-making autonomy, supportive team dynamics, performance-linked pay, and effective communication channels for understanding the organization's strategic direction.

Organizations that provide resources to their employees enable them to become healthier and more satisfied, which leads to enhanced retention. By offering such resources, HPWPs manifest unique personal resources and facilitate the reciprocity principle, reflected in more positive employee attitudes that promote employee retention (EmpRet). This, in turn, reduces turnover costs and helps organizations retain their human capital. Moreover, when organizational resources are combined with personal resources, EmpWB is expected to be much more potent than the influence of either the corporate level of resources alone or solely individual-level resources. By harnessing the synergies between organizational and personal resources, HPWPs can significantly enhance EmpWB and employee attitudes, ultimately leading to improved retention.

Investing in human capital is widely recognized as a critical success factor in the hospitality industry (Madera et al., 2017). In Jordan's hospitality sector, there is a pressing need to enhance employee human capital due to the need for adequate tourism education and limited existing human resources that fail to meet private sector requirements. The need for more skilled labor in the Jordanian hospitality sector has been identified as a significant obstacle to the sector's growth and development. The Jordanian Ministry of Tourism and Antiquities (2016) reported that the hospitality sector is the third-largest employer in Jordan, contributing to 8.6% of the country's GDP. However, the ministry also highlighted the need for more trained professionals to meet the sector's demands and enhance its competitiveness, given that capacity-building activities are fundamental and ongoing requirements for global effective hospitality industry management (Tracey, 2014; Madera et al. al., 2017). Hospitality organizations face the burden of investing more in their employees' knowledge and experiences to fill the skills gap (Jordan Strategy Forum, 2020).

The hospitality sector experiences challenges in attracting suitable labor and retaining valuable human resources, leading to high levels of turnover and significant losses in investment in human capital, quality, and training (Davidson et al., 2010; Bibi et al., 2018). According to a report published by the Bureau of Labor Statistics (2019), the yearly turnover rate in the hospitality business is over 70%, significantly higher than the turnover rate in the vast majority of other industries. High turnover rates in the hospitality industry affect hotel cost structure, workplace efficiency, and productivity due to employee dissatisfaction with working conditions (Deery & Shaw, 1997; Lashley & Chaplain, 1999). The high turnover rate leads to various negative repercussions for hotels, such as lower quality of service, more training expenses, and

reducing customer satisfaction (Bodla & Danish, 2016). Furthermore, jobs in the hospitality sector are often seasonal, involve extended working hours, and are associated with low status and pay (Nilgün, 2017). Moreover, a study by Altamimi and Amin (2017) found that the Jordanian hospitality sector faces challenges in attracting and retaining skilled employees. The study suggested that the sector is not attractive due to poor working conditions, low wages, and limited career development opportunities.

Therefore, this study aims to provide empirical evidence for hospitality management to improve EmpRet, enhance employee experiences, and offer practical implications for selecting the most qualified and suitable employees. By addressing these issues, hospitality organizations can retain their valuable human resources, minimize turnover costs, and enhance the quality of their services, ultimately contributing to the sector's success.

Secondly, previous research has shown that high-performance work practices (HPWPs) can positively impact employee retention in the hospitality sector (Obeng, et al., 2021). However, there is a dearth of research in the hospitality sector that specifically investigates the connection between HPWPs and employee retention. As a result, this study contributes to filling this gap in the literature. It contributes to developing a better knowledge of the efficacy of HPWPs in this specific business. In addition, this study emphasizes the moderating and mediating roles that psychological capital and employee well-being play in the connection between high-performance work practices and employee retention. Therefore, researching the role of these factors in the link between HPWPs and employee retention as possible mediators and moderators provides valuable insights into the underlying mechanism in that relationship.

The structure of this study is presented as follows. The subsequent section provides a literature review that explores topics related to HPWPs and EmpRet, including the mediating role of EmpWB, the moderating mediation role of PsyCap, and the hypotheses derived from existing research. Additionally, the theoretical model developed for this study is introduced. The subsequent sections describe the research methodology, present the study's findings, and discuss the implications of the results. Finally, the study's key outcomes are summarized, limitations are identified, and recommendations for future research are made.

2. Literature Review

High-Performance Work Practices (HPWPs) and Employee Retention (EmpRet)

HPWPs are a collection of several innovative and interdependent human resources practices employed to enhance employee performance and organizational productivity. HPWPs are conceptualized and operationalized in the degree of organizational investment in essential HR practices (Miao et al., 2021). Although there is no consensus regarding the critical components of the HPWPs framework, it typically integrates effective recruitment, job autonomy, team working, staff training, performance management, supportive leadership, competitive financial rewards, and other capability-enhancing practices spanning three broad areas: employee involvement practices, human resource practices, and reward and commitment practices (Sung and Ashton, 2005). The HPWPs components are varied in their impacts on the employees and organizations (Sofijanovna and Zabijakin-Chatleska, 2013; Alatailat et al., 2019; Tawk, 2021). However, Ogbonnaya and Valizade (2018) concluded that HPWPs can be studied and operationalized more effectively when analyzed in aggregate, rather than separately.

Several studies revealed that HPWPs enhance the performance of both individuals (Akhtar et al., 2016) and organizations (Combs et al., 2006) by promoting positive employee attitudes, reducing turnover rates, and enhancing employee abilities in dealing with work-related challenges (i.e., employee resilience and adaptability) (Safavi and Karatepe, 2018). This study focuses on the impact of HPWPs on EmpRet in the hospitality sector, which suffers from a lack

of similar kinds of research. Nevertheless, retaining qualified talents in this sector is a crucial challenge. The high turnover rate in the hospitality sector undermines investment in human capital. Built-in high turnover as a latent factor of hospitality industries entails that anything firms invest in human capital (e.g., employee training) above the minimum required for normative operational efficiency might be considered an expensive waste of resources, particularly as most stakeholders tend to operate on narrow profit margins, and infrastructure costs and overheads are major latent commitments of hospitality firms, due to the fact that staff tend to leave the sector with great regularity (Davidson et al., 2010).

However, the lack of investment in human capital undermines the productivity and competitiveness of hospitality organizations over the long term (Bharwani and Butt, 2012). In this vein, it has long been recognized by academic research that the ability to maintain talented employees is one of the critical challenges facing hospitality organizations, and that the significant pressure placed on employees to deliver high service standards is a major overarching pressure instrumental in high turnover (Deery and Shaw, 1997; Bibi et al., 2018). This is also related to the relatively poor remuneration and attractiveness associated with jobs in the hospitality sector, all of which combine to affect hospitality employees (Nilgün, 2017). One of the critical strategies that could contribute to the talent retention objective in the hospitality sector is investing in HPWPs, which represents tangible benefits to organizations (as well as employees) than may justify investment in human capital. Pittino et al. (2016) found a positive relationship between HPWPs and EmpRet in the hospitality sector, and similar results have also been reported for various sectors and settings, such as family businesses (Pittino et al., 2016), manufacturing (Arthur, 1994), and the services sector (Batt, 2002).

The social exchange theory (Homans, 1958; Cropanzano and Mitchell, 2005) plays a significant role in clarifying the relationship between HPWPs and EmpRet. When employees sense that their organizations invest in their human capital and provide a suitable environment in which they can grow and flourish, they feel indebted to pay back this support by showing desirable attitudes and exerting high effort. For instance, training is a significant indicator of EmpRet, since employees are susceptible to the support they receive, which determines their retention level (Lee and Bruvold, 2003; Koster et al., 2011). In addition, employees are keen to gain more skills and knowledge to enhance their capabilities and employability as an exchange of their contribution to their organizations (Rousseau, 1990).

In addition, remuneration directly contributes to EmpRet, especially when financial rewards are tailored according to organizational needs, and are competitive and linked to performance (Terera and Ngirande, 2014). Supportive leadership (associated with providing employees with information, knowledge, psychological support, inspiration, and encouragement) affects employee desire to stay working for their companies significantly (Chih et al., 2018). Teamwork also enhances the company's brand by boosting the social values needed to encourage employees to stay working for their companies (Ansari and Bijalwan, 2017). Research has also showed that job autonomy plays a crucial role in employee satisfaction and engagement, which predicts EmpRet (Ramlall, 2004). Therefore, based on the above discussion, we assume that:

H1: HPWPs have a significant and positive impact on EmpRet.

The Mediating Role of Employee Well-Being (EmpWB)

Hospitality is a dynamic, service-based sector, where the ability to compete depends mainly on the personnel who deliver services to customers. EmpWB is crucial in customer service-oriented sectors. Usually, well-being refers to positive feelings or emotions (Wright, 2010) and the absence of illness (Meyer and Maltin, 2010). However, Diener et al. (1999) defined EmpWB as “a broad category of phenomena that includes people's emotional responses, domain

satisfactions, and global judgments of life satisfaction”. Well-being cannot be perceived exclusively from narrow aspects such as physical health (Nilgün, 2017). It clearly includes various social, cognitive, and psychological elements of individuals and groups (Buzinde et al., 2014). The hospitality industry has increasingly recognized the importance of employee well-being as a crucial factor for firms' success and competitiveness (Nilgün, 2017; Kim & Lee, 2020). Research has shown that employee well-being can affect employee job satisfaction, productivity, and performance, ultimately impacting customer satisfaction and loyalty (Hsu, Chen, & Chen, 2019; Kim & Lee, 2020). Therefore, understanding and promoting employee well-being in the hospitality industry can significantly affect organizational outcomes.

Several studies revealed that HPWPs improve EmpWB (Macky and Boxall, 2007; 2008), which in turn strengthens employee attitudes and behaviors such as commitment (Meyer and Maltin, 2010) and retention (Wright, 2010), because investing in HPWPs *ipso facto* signals organizations' concern for their employees' health and well-being (van de Voorde et al., 2012). In addition, HPWPs promote supportive workplaces and foster fair and professional atmospheres in organizations. Koster et al. (2011) found that job satisfaction, a key well-being component, mediated the negative relationship between perceived organizational support (i.e., development) and intention to quit. Moreover, Coates and Howe (2015) explained how EmpWB plays a crucial role in enhancing the organization's retention rate. Therefore, we propose that:

H2: Well-being mediates the positive relationships between HPWPs and EmpRet.

The Moderating Mediation Role of Psychological Capital (PsyCap)

PsyCap is an individual's positive psychological state of development that is characterized by: (1) having confidence (self-efficacy) to take on and put in the necessary effort to succeed at challenging tasks; (2) making a positive attribution (optimism) about succeeding now and in the future; (3) persevering toward goals and, when necessary, redirecting paths to goals (hope) in order to succeed; and (4) when beset by problems and adversity, sustaining and bouncing back and even beyond (resiliency) to attain success (Luthans et al., 2007b, p. 3).

We believe that the HPWPs are more powerful in affecting EmpRet through EmpWB when the PsyCap is high. Therefore, we propose that PsyCap boosts the positive relationship between HPWPs and EmpRet. PsyCap works with organizational resources and EmpWB to enhance positive attitudes inside organizations.

The literature shows that people with a high level of self-efficacy, which is a key component of PsyCap, rely on hard work, not luck; they believe that their destiny is mainly determined by their effort and persistence, not by external factors (Avey et al., 2010b). In addition, people who have a high level of PsyCap are more successful and able to deal with job challenges effectively (Valcour and Ladge, 2008). They have a high level of optimism that enhances their capabilities and resilience to successfully deal with job demands (Xanthopoulou et al., 2009). PsyCap leads to positive employee attitudes towards their roles and their organizations (Lisbona et al., 2018). Employees with robust PsyCap are more likely to experience higher job satisfaction and less burnout, and are more likely to be highly engaged in their work, thus yielding better performance (Lisbona et al., 2018; Ta'Amnha et al., 2021c). Avey et al. (2009a) found a negative relationship between PsyCap and intention to leave. Therefore, Obeng et al. (2021) considered PsyCap an employee retention booster in the hospitality sector. However, they explained that the impact of the PsyCap on EmpRet is moderately significant and not direct; therefore, other factors should be considered in studying this relationship since EmpRet is a function of several other factors, such as employees' well-being and commitment.

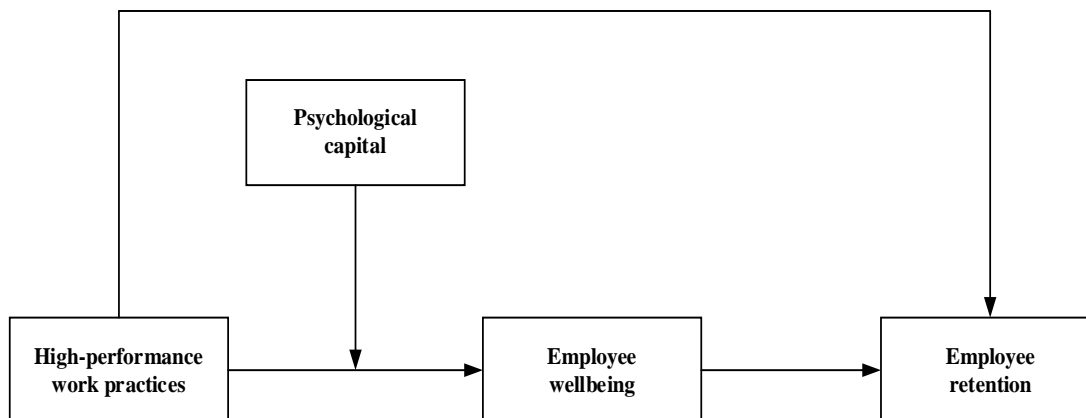
Therefore, based on the above discussion, we assume that:

H3: PsyCap has a significant and positive impact on the relationship between HPWPs and EmpRet via EmpWB.

Theoretical Model

The theoretical model of this study, combining all of the previously proposed hypotheses, is displayed in Figure 1.

Figure 1: Theoretical model



3. Data and Methodology

Questionnaire Measures

A structured, quantitative questionnaire was developed, distributed, and analyzed to test the research model. It consists of measurement items representing each research variable (i.e., HPWPs, EmpWB, EmpRet, and PsyCap), adopted from the published literature. HPWPs were measured using 22 items taken from (Miao et al., 2021); EmpRet was measured using six items taken from (Govaerts et al., 2011); and PsyCap was measured using four six-item sub-scales adopted from Luthans et al. (2007a, 2007b). EmpWB consists of 8 items adopted from Lin et al., (2014).

In the above four scales, the respondents indicated their agreement with each measurement item on a five-point Likert-type scale, with responses ranging from 1 (strongly disagree) to 5 (strongly agree).

The quantitative survey was administered to collect primary data from employees in the Jordanian hospitality sector between June 2021 and September 2021. We referred to the database of the Jordan Hotels Association to identify hotels in Jordan and their contact information, with which we directly contacted hotels to invite them to participate in this research, by encouraging staff to fill out the online questionnaires. Finally, we got 1319 usable responses, reflecting a high response rate compared to several previous empirical studies conducted in Jordan and used a similar distribution method (e.g., Al-Tahat and Bwaliez, 2015; Bwaliez and Abushaikha, 2019; Sharabati et al., 2020; Bwaliez, 2021; Rifai et al., 2021; Ta’Amnha et al., 2021a, 2021b, 2021c).

Assessment of Common Method Variance (CMV)

Because only one survey was collected from each person who participated in this study at any given time, there is a possibility of common method variance (CMV) problems, which could affect the validity of our results. Therefore, we decided to perform Harman's one-factor test (Podsakoff, 2003) to ensure that no single factor accounted for the largest covariance between

the predictor and the criterion variable. Factors with eigenvalues greater than one showed a total variance of 82.3%, and the first factor explained 38.7% of the total variance. This indicates that there is no CMV problem.

Questionnaire Validity and Reliability

The questionnaire scales were translated from English to Arabic and assessed for conceptual equivalence using back translation (Brislin, 1980). To enhance the content validity of the questionnaire, it was reviewed by four HRM scholars and four managers from various hotels in Jordan. Next, construct validity was evaluated through unidimensionality, convergent validity, and discriminant validity.

Confirmatory factor analysis (CFA) was utilized to analyze four major indices, namely the comparative fit index (CFI), incremental fit index (IFI), Tucker-Lewis index (TLI), and root mean square error of approximation (RMSEA), to determine the unidimensionality of the underlying constructs. The RMSEA value was below the recommended cutoff of 0.05, and the CFI, IFI, and TLI values were above the recommended cutoff of 0.9 (Hu and Bentler, 1999).

To assess convergent validity, the average variance extracted (AVE) for each construct and factor loadings for each questionnaire were evaluated. All items of each construct had statistically significant factor loadings greater than 0.50 ($p < 0.01$), and the AVE for each construct was higher than the suggested minimum value of 0.50 (Fornell and Larcker, 1981), indicating high convergent validity.

Discriminant validity was determined by analyzing the squared correlation between each construct and the other constructs. The AVE values of each construct were greater than the squared correlation with all other constructs, indicating acceptable discriminant validity (Fornell and Larcker, 1981). Finally, reliability was assessed through Cronbach's α coefficient and composite reliability (CR) (Sekaran and Bougie, 2016), with values exceeding the recommended threshold of 0.7 (Fornell and Larcker, 1981; Hair et al., 2017).

4. Results and Discussion

Descriptive Statistics and Correlations Among Study Variables

Table 1 shows that there is a positive correlation among the study factors, namely HPWPs, EmpWB, EmpRet, and PsyCap, as revealed by the data.

Table 1: Descriptive statistics and correlations among study variables

Study variable	Mean	SD	1	2	3	4
HPWPs	3.33	.52	(0.87)			
Employee well-being	3.37	.43	0.79**	(0.93)		
Employee retention	3.67	.66	0.478**	.564**	(0.85)	
Psychological capital	3.82	.58	0.554**	0.596**	0.656**	(0.84)

Notes: $n = 1319$, ** $p < 0.000$, Cronbach's α coefficient is in parentheses.

Testing the Relationship Between HPWPS and Employee Retention

According to Table 2, there is a significant effect of HPWPs on EmpRet ($R^2 = 0.229$, $p < 0.000$), with the HPWPs provided by companies accounting for 22.9% of the variance in EmpRet, thereby supporting H1.

Table 2: Regression statistics of HPWPs against employee retention

R	R²	Adjusted R²	Standard error of estimate
0.478	0.229	0.228	0.57684

Testing the Mediating Effect of Employee Well-Being on the Relationship Between HPWPs and Employee Retention

To test H2, a hierarchical regression analysis was conducted. The data in Table 3 demonstrate that HPWPs have a significant effect on EmpRet, as evidenced by the results of model 1. Additionally, the data in model 2 indicate that EmpWB mediates the relationship between HPWPs and EmpRet ($\Delta R^2 = 0.093$, $\Delta F = 179.455$, $p < 0.000$). These findings support H2, indicating that the positive relationship between HPWPs and EmpRet is partially explained by the mediating effect of EmpWB.

Table 3: Results of hierarchical regression analysis

Dependent variable: Employee retention				
	Model 1		Model 2	
	b	SE	b	SE
HPWPs	0.601*	0.030	0.108*	0.047
Employee well-being			0.758*	0.057
R ²	0.229*		0.321*	
ΔR^2			0.093	
ΔF			179.455*	

Notes: b is unstandardized regression coefficients, SE is standard error, * $p < 0.001$.

Moderated Mediation of Psychological Capital

Model 7, implemented using the Macro-process-plugin, was utilized to assess the impact of the moderated mediation of HPWPs on EmpRet, considering the mediation of EmpWB and the moderation of PsyCap. Table 4 presents the results of the mediation regression (EmpWB) on PsyCap, HPWPs, and their interaction. The data reveal that the interaction between HPWPs and PsyCap was statistically significant ($b = 0.0701$, $SE = 0.0206$, $p < 0.05$), indicating that PsyCap moderates the effect of HPWPs on EmpWB.

Table 4: Regression of the mediation (employee well-being) onto psychological capital, HPWPs, and their interaction

Outcome Variable: Employee well-being							
Model Summary	R	R-sq	MSE	F	df1	df2	p
	.8145	.6634	.0625	863.7526	3.0000	1315.0000	.0000
Model	coeff	SE	t	p	LLCI	ULCI	
Constant	3.3553	.0077	435.4261	.0000	3.3401	3.3704	
HPWPs	.5358	.0162	33.1525	.0000	.5041	.5675	
Psychological capital	.1731	.0143	12.1307	.0000	.1451	.2011	
Int_1	.0701	.0206	3.4099	.0007	.0298	.1105	
Product terms key:							
Int_1:	HPWPs * Psychological Capital						

Using the conventional "pick-a-point approach," Table 5 and Figure 2 illustrate the simple slopes of the relationship between HPWPs and EmpWB at three points along the scale of the moderator. At -1SD on PsyCap, the effect of HPWPs was positive and significant ($b = 0.4949$, $SE = 0.0220$, $p < 0.000$). At the mean of PsyCap, the effect of HPWPs was also positive and significant ($b = 0.5358$, $SE = 0.0162$, $p < 0.000$). Furthermore, at +1SD PsyCap, HPWPs was a significant positive predictor ($b = 0.5767$, $SE = 0.0181$, $p < 0.000$). These results suggest that the slope becomes increasingly positive as PsyCap increases.

Table 5: Conditional effects of the focal predictor at different values of the moderator

PsyCap	Effect	SE	t	p	LLCI	ULCI
-0.5827	0.4949	0.0220	22.5347	0.0000	0.4519	0.5380
0.0000	0.5358	0.0162	33.1525	0.0000	0.5041	0.5675
0.5827	0.5767	0.0181	31.8814	0.0003	0.5412	0.6121

Figure 2: The moderating impact of psychological capital on the indirect relationship between HPWPs and employee retention via employee well-being

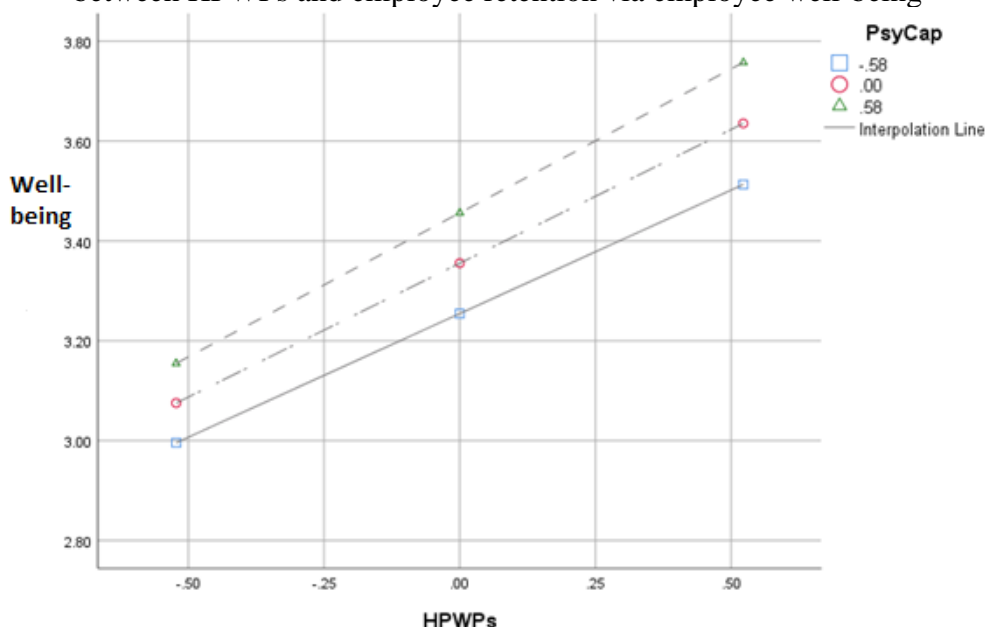


Table 6: Regression results of process analysis

Outcome variable: Employee retention						
Model Summary						
R	R-sq	MSE	F	df1	df2	p
0.5670	0.3214	0.2930	311.6904	2.0000	1316.000	0.0000
Model						
	Coeff	SE	t	p	LLCI	ULCI
Constant	1.1163	0.1910	5.8439	0.0000	0.7415	1.4910
HPWPs	0.1083	0.0466	2.3252	0.0202	0.0169	0.1997
Employee well-being	0.7576	0.0566	13.3961	0.0000	0.6467	0.8686

Table 7 displays the results of an omnibus test of the conditional indirect effect, as indicated by the index of moderated mediations of X on Y (Preacher et al., 2007). If the null hypothesis (0) does not fall within the lower and upper bounds of the 95% confidence interval, it can be concluded that the indirect effect is conditional on the level of the moderator variable (W). Thus, the results suggest that PsyCap moderates the indirect effect of HPWPs on EmpRet. Since the index of moderated mediation is statistically significant, further analysis was conducted to probe the conditional effects. Table 7 demonstrates the conditional indirect impact of HPWPs (X) on EmpRet (Y), revealing that there are indirect effects at (-1SD), the mean, and (+1SD) on the PsyCap variable.

The analysis of the conditional indirect effects at three points along the PsyCap scale revealed that all three indirect effects were positive and statistically significant. Specifically, at -1SD, the indirect effect was 0.3750, at the mean it was 0.4059, and at +1SD, it was 0.4369. None of the 99% confidence intervals included the null value of 0, indicating that the indirect effects were significant. Taken together, these findings support H3, which proposes that PsyCap moderates the indirect effect of HPWPs on EmpRet through EmpWB.

Table 7: Direct and conditional indirect effects of X on Y and the index of moderated mediation

Direct Effect of X on Y					
Effect	SE	t	p	LLCI	ULCI
.1083	0.0466	2.3252	0.0202	0.0169	0.1997
Conditional Indirect Effects of X on Y					
HPWPs -> Employee well-being -> Employee Retention					
Psychological Capital	Effect	BootSE	BootLLCI	BootULCI	
-0.5827	0.3750	0.0417	0.2998	0.4619	
0.0000	0.4059	0.0389	0.3350	0.4857	
0.5827	0.4369	0.0383	0.3649	0.5144	
Index of Moderated Mediation					
	Index	BootSE	BootLLCI	BootULCI	
Psychological Capital	0.0531	0.0166	0.0197	0.0851	

Discussion

The primary aim of this investigation was to bridge the gap in the literature by examining the mediating role of EmpWB in the links between HPWPs at the organizational level and EmpRet, as well as exploring whether PsyCap moderates the effect of HPWPs on EmpRet through EmpWB. The supported hypotheses of this study justify its purpose and yield various theoretical and practical implications.

By demonstrating that EmpWB acts as a mediator in the connection between HPWPs at the organizational level and EmpRet, this research contributes to the gap in the literature on the influence mechanism between HPWPs at the organizational level and individuals' job attitudes (Ogbonnaya et al., 2017).

The JD-R and AMO models propose that organizations' resources heighten EmpWB, motivating employees to remain loyal to their organizations. The results of this study corroborate prior research that has established a positive correlation between HPWPs and employee well-being (Kim & Lee, 2020; Song et al., 2020). Additionally, the outcomes align with studies that have demonstrated a positive connection between HPWPs and employee job satisfaction and organizational commitment (Huang et al., 2021; Miao et al., 2021). The present

study contributes to the literature by exhibiting that EmpWB is a mediator in the association between HPWPs and EmpRet. This discovery is supported by research identifying well-being as a mediating factor in the relationship between HPWPs and job attitudes (Parker & Griffin, 2014; Song et al., 2020).

The current investigation adds to the existing literature by exploring the moderating function of PsyCap in the correlation between EmpWB and EmpRet. This aligns with previous research indicating the value of PsyCap in augmenting employee job attitudes (Avey et al., 2011c; Li et al., 2020). Furthermore, the study confirms that HPWPs can positively affect employee well-being, even in a challenging industry such as hospitality (Li et al., 2020). The results of this study propose that hospitality businesses can enhance their employees' job attitudes and retention by adopting HPWPs and promoting employee well-being.

Additionally, demonstrating the direct and indirect associations among HPWPs, EmpWB, and EmpRet emphasizes acknowledging the influence of personal resources, such as PsyCap, on employee attitudes and performance (Hsieh et al., 2019). The existence and degree of employees' PsyCap enhance the favorable impact of HPWPs on their job attitudes, suggesting that the advantages of investing in HPWPs significantly rely on the traits of employees, which can differ across diverse socio-cultural contexts, economic sectors, organizations, and individuals.

6. Conclusion

Employees' ability to deal with the challenges and difficulties of their jobs depends mainly on the resources inherent in them and from their organizations (Bakker et al., 2005). The results of this research support this assumption, as the HPWPs supplement the positive effect of PsyCap on EmpWB. PsyCap works as a buffer that mitigates the negative impact of demanding working conditions on hospitality workers; this, therefore, protects employees from severe work intensifications, as they are more resilient to manage job responsibilities effectively (Ogbonnaya et al., 2017), which in turn increases the corporate retention rate. HPWPs contribute significantly to creating an attractive employer brand that increases employees' attachment to their organizations (Ta'Amnha et al., 2021b). Therefore, organizations need to invest in HPWPs and their employees' PsyCap. In addition, PsyCap should be considered when hiring and promotion decisions are made, because this type of capital increases employee performance, thus enhancing the quality of staffing decisions.

Though conducting this cross-sectional study did not affect the quality of its results, we recommend that future research be conducted to collect data to investigate the research model at different points in time, to identify longitudinal patterns. In addition, the data was collected from only one sector (hospitality), so we recommend that future research generate data from various samples of firms from different industries to enhance the generalizability of the research results.

By corroborating the significant contribution of HPWPs as a source of enriching EmpWB, this study responds to the call for more research to identify the antecedents of EmpWB based on multi-level design (Miao et al., 2021), particularly by analyzing the hospitality sector in West Asia. This research was conducted in Jordan, a West Asian country that lacks HR knowledge compared to other global contexts. By revealing the positive relationship between HPWPs, EmpWB, and EmpRet, this supports the proposition that the HPWPs can function as a universal human resources strategy that significantly affects employees and organizations regardless of particular contextual and social factors. Aside from the particular findings of this study related to HPWPs, EmpWB, and EmpRet, this study contributes insights that are critical for a significant and beleaguered economic sector for Jordan and Asia in general: the hospitality

sector and its associated industries, which have been decimated by over two years of on-going impacts of the Covid-19 pandemic.

Global and national tourism was utterly shut down in 2020 and 2021 due to immediate lockdowns and the general collapse of the tourism industry during this period. Recovery remains tentative and uncertain, particularly in West Asia. At this juncture, organizations must identify ways to maximize employee engagement and productivity, reducing burnout and turnover. These objectives are essential rationales to “arrest a dangerous downward spiral” seen in the Asian context during this period, as noted by The Conference Board’s observation of global well-being trends (Karpe, 2022, p.2). The current study contributes directly to this area, identifying ways organizations can make targeted improvements to facilitate recovery among employees in Asia commonly experiencing exacerbated economic uncertainty, stress, and burnout, with grave implications for unsustainable economic performance that threaten the economic development of organizations and national economies.

Hospitality sector employees must safeguard their human capital by investing resources in EmpWB development, beyond a traditional focus on essential physical and mental health (which was itself sadly lacking prior to Covid-19) (Karpe, 2022), in order to enable the tourism sector to support macroeconomic development and well-being among the general public. This is particularly important in West Asia, where a report by the United Nations Economic and Social Commission for Western Asia (2021) noted that Covid-19’s impacts were “felt most acutely in the region’s high-performing tourism sector, which led to a significant weakening of hospitality, transport, and wholesale and retail trade services”. In the case of Jordan, with its limited natural resources, the tourism sector is even more critical, underscoring the need for urgent remedial steps to jump-start the tourism sector and the West Asian economy in general, moving forward in the coming years.

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The Relationship between Sustainability and Stock Market Performance in BIST Companies

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Abstract

In today's global competitive landscape, the consumption of natural resources has become a significant factor shaping conditions. As a result, companies have recognized the importance of sustainability and have prioritized it accordingly. Investors and company stakeholders consider the list of companies included in the Sustainability Index as a significant reference point. Companies included in the Sustainability Index publish an annual sustainability report to draw the attention of investors and company stakeholders. In this context, it is crucial to understand how the value derived from sustainability indicators influences the profitability and stock market performance of a company. The aim of this study is to determine the relationship between the sustainability index value and stock market performance of companies listed in Borsa Istanbul and included in the sustainability index with the help of Dumitrescu and Hurlin (2012) panel causality analysis. Analyses have been conducted for 15 companies included in the sustainability index since 2015. The analysis revealed a bi-directional causality relationship between the sustainability index and price/earnings ratio during the period of 2015-2022.

Keywords: sustainability index; price/earnings ratio; stock market performance; panel causality analysis

1. Introduction

The effects of the globalizing world and the increase in environmental and social events with industrialization have led to the concept of sustainability. Corporate sustainability has started to be taken into account by the world stock exchanges. In this context, a guideline is needed for companies to formulate policies on corporate governance risks (Humphrey et al., 2012; Haan et al., 2012). With this guideline, a platform has been created to guide companies and communicate information on companies' sustainability policies to responsible investors. The mission of this platform is to communicate knowledge to responsible investors. Based on this mission, a list has been created by the BIST Sustainability Index since 2014.

Sustainability indicators are variables that directly affect the economic situation in terms of competition and investor relations. Costs and cost reduction, sales and profit margin, risk and risk mitigation, reputation and brand value, attractiveness as an employer, and discovering innovative talent are vital aspects in achieving sustainability (Sudha, 2015). Realizing sustainability ensures long-term success in today's trading systems. These initiatives also reveal the importance of sustainability for companies (Durand et al., 2019).

Companies consider potential and existing investor relations when making financing, investment, and operational decisions in order to achieve their goals. Investors and stakeholders also take companies' sustainability performance into account. Companies have therefore had to make operational decisions to strengthen their sustainability performance (Charlo, 2015). When making financing decisions, investment decisions, and operational decisions, companies prioritize factors such as competitiveness, sustainability in national and international markets, and growth strategy. To enhance the sustainability performance of companies, it is crucial to maintain a strong presence in the international market and successfully implement the growth strategy (Alshehhi et al., 2018).

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A sustainability strategy is developed by incorporating sustainability indicators to ensure the ongoing presence of companies in the international market and to effectively implement their growth strategy. Because potential and existing investors are interested in company performance (Charlo et al., 2017). Companies aim to influence their sustainability performance by creating sustainability strategies.

2.Sustainability and Performance Relationship

Companies are not only accountable for the environmental and social issues they generate themselves, but also for the environmental and social problems caused by their suppliers, who enable their operations to continue (Cantele and Zardini, 2018). The global climate change is bringing greater attention to the threats posed to environmental sustainability (Drempetic et al., 2021). As a result of these factors, companies are facing increasing societal, national, and international pressures to prioritize and address environmental sustainability concerns. Sustainability has indicators of environmental, social and financial sustainability (Alareeni and Allam, 2020).

Social sustainability encompasses advocating for the rights of employees by ensuring fair employment practices, job security, and opportunities for meaningful participation in decision-making processes (Friede et al., 2015). This definition includes the four categories and sub-elements of social sustainability in GRI standards. The first category is work worthy of human nature. This category focuses on promoting equal opportunities and includes factors such as the representation of women in the company's workforce, the proportion of women in managerial positions, and the amount of training provided by the company per employee (Gregory et al., 2016). The second category includes the assessment of human rights. The category of assessment of human rights relates to how much the company cares about the human factor in the social sphere. The third category within social sustainability is the local community. It focuses on the local community, relations with local people and the company's anti-corruption methods. This category also shows the communication between the local population and the company's elements. The last category is the retail sale of the product. The retail category of the product gives importance to the company's customer orientation and marketing communication (Jiraporn et al., 2014; Khan, 2019; Wong and Zhang, 2022).

Environmental sustainability entails companies utilizing environmental resources in a effective and efficient manner, ensuring continuity of future production while considering long-term risks. Specifically, environmental sustainability is linked to companies' capacity to recycle non-renewable resources and employ renewable resources (Vives and Wadhwa, 2012). There are five categories of environmental sustainability under the GRI standards. These are energy, water, employee compliance with environmental policies, supplier environmental assessment and production (Park and Jang, 2021).

Financial sustainability involves striking a balance between environmental and social sustainability while considering the company's financial standing (Dorfleitner et al., 2018). It is an indicator encompassed within companies' sustainability metrics. The performance of companies can be comprehended by analyzing liquidity and profitability ratios, which serve as accounting-based financial indicators (Kim et al., 2022).

Sustainability capacity has become important for investor relations today when company performance is evaluated. The interaction of companies with their stakeholders is important for their sustainability capacity (Yoon et al., 2018). This interaction plays a crucial role in any sustainability strategy. Sustainability strategies can be developed by engaging with both internal and external stakeholders through effective communication (Gupta, 2018). The common goal of all companies is to maximize the company's profitability under current market conditions. Modern business practices emphasize the importance of companies operating in a

manner that considers their stakeholders (Boubaker et al., 2022). In contemporary circumstances, strategies have become crucial in achieving companies' sustainable objectives and ensuring long-term sustainability. Companies incorporate projects and activities as specific objectives that facilitate the formulation of their sustainability strategies. The specific objectives enabling the development of companies' sustainability strategies include aligning the organizational structure with sustainability goals and assessing the level of market competitiveness (Erragragui, 2018).

Companies' sustainability strategies for their stakeholders have two points. The first of these points is to minimize the negative impact of companies on environmental resources (Velte, 2017). The second point is the efficient use of natural resources. Companies that receive positive support for their sustainability indicators in terms of investor relations gain economic credibility in the market. For companies, this credibility has revealed the meaning and contributions of sustainability (Heinberg and Lerch, 2010). As a result, companies nowadays emphasize in their reports their focus on environmental indicators stemming from production activities, such as natural resource utilization, energy consumption, waste generation, and pollution (Kanuri, 2020). Furthermore, these reports furnish investors with information regarding companies' sustainability indicators, economic metrics, and management performance. Managers of companies have begun to prioritize sustainability as part of the overall management performance of their organizations (Van Stekelenburg et al., 2015; Filbeck et al., 2019).

The industrial production of companies can be defined as establishing a stable relationship between their sustainability performance and financial structures. The industrial production of companies has been important for stakeholders (Lourenço et al., 2012). Maintaining long-term stability in financial data is crucial for indicators of environmental performance, social performance, and economic performance. In today's global trading system, competitiveness and investor relations have become important (Steen et al., 2020). In this context, it is essential for company management to maintain a stable relationship between their sustainability performance and financial structures (Leins, 2020).

3. Econometric Analysis

3.1. Data and Econometric Methodology

The main purpose of the study is to examine the causality relationship between sustainability and stock market performance with the help of Dumitrescu-Hurlin (2012) panel causality test, through annual data for the 2015-2022 period in BIST companies. All the series are annual and obtained from BIST databases.

Table 1: Dataset description

Variables	Variables Description	Data Source
SI	Sustainability Index	BIST
P/E	Price/Earnings Ratio	BIST

The study sample includes 15 BIST companies (AEFES, ARCLK, ASELS, BIMAS, COLA, EREGL, FROTO, GUBRF, KOZAA, PETKM, PGSUS, SISE, TCELL, ULKER, VESTL). To analyze the causal relationships between sustainability and stock market performance (P/E ratio) panel causality test developed by Dumitrescu and Hurlin (2012) was used. Before carrying out this test, we first tested the existence of cross-sectional dependence between variables employing Breusch-Pagan (1980) (Lagrange Multiplier-LM) and Pesaran (2004)

(Cross-section Dependence-CD) and Pesaran, Ullah and Yamagata (2008) (Bias-Adjusted Cross Sectionally Dependence Lagrange Multiplier- CDLM) tests. And then, based on the results of the cross-sectional dependence tests, we performed second generation panel unit root tests of CIPS test. In addition, the homogeneity of delta tilde tests of Pesaran and Yamagata (2008), and the test results were presented in Table 2. Finally, we applied the Dumitrescu-Hurlin (2012) Panel Causality Test.

The Dumitrescu-Hurlin test can predict cross-section dependence and cross-section independence situations. When we examine the traditional panel Granger causality tests, it can be seen that if there is a causal relationship in a sub-group of the variable, due to the lack of cross-sectional information, that is because of the homogeneous null hypothesis. The null hypothesis means that there is no Granger causality relationship in cross-sections, and the alternative hypothesis expresses a Granger causality relationship for at least one cross-section (Dumitrescu and Hurlin, 2012). Dumitrescu and Hurlin (2012) used the following equation for panel causality test considering the linear heterogeneous model:

$$y_{it} = \alpha_i + \sum_{k=1}^L \gamma_i^k y_{it-k} + \sum_{k=1}^L \beta_i^k x_{it-k} + \varepsilon_{it}, i = 1, 2, \dots, N; t = 1, 2, \dots, T \quad (1)$$

Where α_i denotes individual effects, γ_i^k and β_i^k represents the lag and slope parameters, and L supposed to be the lag orders. We can summarize the model's assumptions as; the individual effects are constant, besides the same lag length in cross-section, the coefficients of slope and lag parameters vary across units and especially a balance panel must be required for the Dumitrescu-Hurlin test. The null and alternative hypotheses equation are as follows:

$$\begin{aligned} H_0: \beta_{i1} = \dots = \beta_{iK} = 0 \forall i = 1, \dots, N \\ H_1 = \beta_{i1} = \dots = \beta_{iK} = 0 \forall i = 1, \dots, N_1 \\ \beta_{i1} \neq 0 \text{ or } \beta_{iK} \neq 0 \forall i = N_1 + 1, \dots, N \end{aligned} \quad (2)$$

When we consider the null hypothesis, it can be seen that there is no Granger causality relationship between variables for all units. In contrast, the alternative hypothesis represents at least one unit that there is evidence of Granger causality between variables. Individual residues are independent for each cross-section unit. Therefore, while the alternative hypothesis supports heterogenous results, the null hypothesis is a heterogenous model providing homogenous results. This test is usually distributed and allows (Dumitrescu and Hurlin, 2012). To determine the outcome of the Dumitrescu-Hurlin panel causality test hypotheses, one can use a test statistic, which is the mean of all test statistics of cross-sectional units.

$$W_{N,T}^{HNC} = \frac{1}{N} \sum_{i=1}^N W_{i,T} \text{ (HNC: Homogeneous Non-Causality)} \quad (3)$$

Where $W_{i,T}$ represents the test statistics of each cross-sectional unit. In this test, one can obtain two different test statistics based on whether T is greater or less than N. These test statistics are $Z_{N,T}^{HNC}$ and Z_N^{HNC} obtained from $W_{N,T}^{HNC}$. When $T > N$, we use $Z_{N,T}^{HNC}$ statistics. On the otherhand if $T < N$ we use Z_N^{HNC} statistics. Furthermore, the following equations give these statistics.

$$Z_{N,T}^{HNC} = \sqrt{\frac{N}{2K}} (W_{N,T}^{HNC} - K) T, N \rightarrow \infty, N(0,1) \quad (4)$$

$$Z_N^{HNC} = \frac{\sqrt{N}(W_{N,T}^{HNC} - N^{-1} \sum_{i=1}^N E(W_{i,T}))}{\sqrt{N^{-1} \sum_{i=1}^N \text{Var}(W_{i,T})}} N \rightarrow \infty, N(0,1) \quad (5)$$

3.2. Findings

The cross-sectional dependency between the series was analyzed with the LM CD test developed by Pesaran (2004) and the LM adj. test whose deviation was corrected by Pesaran et al. (2008) and the test results are presented in Table 2. Since the probability values of the test results were below 5%, null hypothesis (there is no cross-sectional dependency) was rejected and it was determined that there was a cross-sectional dependency between the series. In addition, the homogeneity of the co-integration coefficients was tested using the delta tilde and corrected delta tilde tests of Pesaran and Yamagata (2008), and the test results were presented in Table 2. Since the probability values of the test results were below 5%, null hypothesis (slope coefficients are homogeneous) was rejected and it was determined that the co-integration coefficients were heterogeneous.

Table 2: Cross-sectional dependence tests and homogeneity test results

Cross-sectional Dependency Test (H₀: There is no cross-sectional dependency)		
Test	Test Statistics	p
LM (Breusch and Pagan, 1980)	38.483	0.015
LM _{adj} (Pesaran et. al, 2008)	39.509	0.009
LM CD (Pesaran, 2004)	40.332	0.000
Homogeneity test (H₀: Slope coefficients are homogeneous)		
Test	Test Statistics	p
Delta_tilde	19.561	0.000
Delta_tilde_adj	21.118	0.000

In this study, second-generation unit root tests should be used as cross-sectional dependency is determined. The second-generation unit root test of CIPS was used in this study. The results of the CIPS test are given in Table 3.

Table 3: Results of CIPS panel unit root test

Variables	Level		First Difference	
	Constant	Constant + Trend	Constant	Constant + Trend
SI	-1.098	-1.116	-8.512*	-9.110*
P/E	-1.194	-1.214	-9.447*	-9.925*

*significant at 5% level

In CIPS tests, the maximum lag length was taken as 1 and the optimal lag length was determined according to the Schwarz information criterion. It is seen that hypothesis zero is rejected at 1% and 5% significance levels. Unit root test results show that the series are not stationary at the level, in other words, the variables are stationary at level I(1).

Table 4: Dumitrescu and Hurlin (2012) Causality Test Results

Null Hypothesis	Test	Statistics	p
DLogSI does not granger cause DlogP/E	<i>Whnc</i>	7.275	0.000
	<i>Zhnc</i>	8.334	0.000
	<i>Ztild</i>	8.719	0.000
DlogP/E does not granger cause DLogSI	<i>Whnc</i>	1.217	0.123
	<i>Zhnc</i>	1.388	0.207
	<i>Ztild</i>	1.905	0.316

As can be seen from Table 4; the P/E variable is not the granger cause of the SI variable. On the other hand, the SI variable is the granger cause of the P/E variable. Unidirectional causality running from SI to P/E has been determined (SI→P/E).

4. Conclusion

Companies aim for their stakeholders to align with global trade, meet their expectations, enhance investments, and ensure the provision of reliable information to stakeholders. The realizability of these expectations is measured by credible institutions. Corporate sustainability encompasses the alignment of social, environmental, and economic factors with companies' activities and decision-making processes. Its objective is to create long-term value in accordance with corporate governance principles while effectively managing potential risks and hazards associated with these issues. To develop an effective corporate sustainability strategy, companies should consider the economic, environmental, and social dimensions of sustainability as interconnected components. By approaching these dimensions holistically, companies can formulate strategies that address all aspects of sustainability in a coordinated manner. The Sustainability index published by BIST provides a reliable environment for investors by showing the sustainability performance of companies.

The aim of this study is to determine the relationship between the sustainability index value and stock market performance of companies listed in Borsa Istanbul and included in the sustainability index with the help of Dumitrescu and Hurlin (2012) panel causality analysis. Analyses have been conducted for 15 companies included in the sustainability index since 2015. The analysis revealed a bidirectional causality relationship between the sustainability index and price/earnings ratio during the period of 2015-2022.

The strength of the positive relationship between corporate sustainability and financial performance is closely linked to the level of transparency and development in the country and market where the company operates. Companies that prioritize sustainable practices in transparent and developed markets will also reap financial benefits as a result. The absence of immediate financial gains from sustainability practices should not deter companies from continuing these practices. Given the rising sensitivities and negative agenda globally and in our country, companies that prioritize their stakeholders' wishes must carefully engage in sustainability practices. Furthermore, in order to embrace a sustainable lifestyle, companies should also emphasize sustainability through non-financial incentives, such as participating in seminars, workshops, and meetings, and learning from the experiences of other companies. Furthermore, the correlation between sustainability performance and financial performance is also linked to the presence of a well-developed legal system that ensures strong shareholder

rights protection and transparent monitoring of the company's activities. In countries with well-developed legal systems, shareholders can effectively assess and assign value to sustainability-related investments and activities. As a result, the relationship between sustainability performance and financial performance is likely to be positive in such cases.

It is accurate to say that BIST investors have not yet distinctly priced sustainability considerations. Index companies might not have fully recognized the economic advantages associated with being listed on the sustainability index. Businesses should bear in mind that the key to maximizing profitability lies in being sustainable and meeting the expectations of their stakeholders. By only doing so businesses can gain a competitive advantage, optimize resource utilization, and enhance their corporate reputation.

Research focused on various sectors that investigates the factors behind intra-sectoral or inter-sectoral variations among companies in the index and assesses the long-term impact of the index will make valuable contributions to the literature. Furthermore, it is considered important to examine and explore different variables when determining and investigating the dependent and independent variables, while also extending the research scope to encompass longer time periods. Lastly, conducting future analyses using a dataset and model that facilitate comparisons with companies that have never been part of the sustainability index could provide valuable insights.

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Effectiveness of Dynamic Factor Analysis Approach in Financial Data

Pınar Tokal¹

Abstract

Factor Analysis (FA) is one of the multivariate analysis techniques that is frequently used in many fields, especially in social sciences. FA aims to find a small number of new unrelated variables by bringing together related variables. Thus, it is a method of reducing size and destroying the dependency structure. However, it does not give very successful results on time series examining economic and financial variables. Due to the data structure of the time series, FA is not suitable due to the problems arising from the fact that the observations are independent and do not provide assumptions such as distribution in a similar way. Time-dependent financial data usually has an upward trend and a dependency on the series. Dynamic Factor Analysis (DFA) was developed for the purpose of dimension reduction in such data by analyzing the latent factors in time series with as few assumptions as possible and provided a solution to an important problem. In the study, dynamic Factor Analysis was applied by considering 38 financial variables that are thought to shape the BIST index. The aim here is to provide factorization by reducing dimensions in terms of the variables in question, by combining the variables that are effective on the stock market index, and to create a leading value that can be an early warning indicator.

Keywords: factor analysis; dynamic factor analysis; financial variables

1. Introduction

One of the most important factors in determining the decisions of people and institutions trading in the stock market is the stock market index in which the stock is included. Stock markets are closely followed by many individuals, institutions and structures such as investors, business managers, market makers, and economic management. The development of stock markets means an increase in transaction volumes, an increase in the market values of companies, financing for companies, growth for the economy and earnings for the investor.

Stock supply and demand are affected by many economic and financial factors. In the globalizing world, practices that limit money and capital movements have disappeared. Investors can manage their investments worldwide in the coordination of risk and return. Creating a portfolio by taking into account the variables that shape the stock market index reduces the risks of the investor (Lewis et al., 2020).

Financial data, by its nature, have trend and seasonal effects. Therefore, the traditional factor analysis method is not an effective reduction process in this case. Dynamic factor analysis is one of the appropriate methods for time series variables.

Standard factor analysis (FA) doesn't work directly with typical macroeconomic time series because the characteristics of the data usually conflict with the assumptions (Chen et al., 2014). FA has been developed for cross-sectional data where the assumptions are often reasonable (Alvarez et al., 2016; Lin and Michailidis, 2020). Most notably, FA theory assumes observations which are independent and identically distributed. Macro-economic data typically trend upwards and are serially dependent, so the identically distributed assumption is violated (Gonçalves et al., 2017; Kuchibhotla and Chakraborty, 2020). Many applications of FA assume that intercepts are uninterested in free parameters which implies that sample means can be

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subtracted, and the centered data treated as mean zero and identically distributed (Lucchetti and Venetis, 2020).

Dynamic factor analysis (DFA) is a combination of factor analysis and time series analysis (Poignard and Terada, 2020). The basic motivation resides in their capability of reducing a large set of time series to only few indicators (factors) (Zhang and Wu, 2021). If the number of time series data is large as compared to the available number of observations, then most information may be conveyed to the factors (Solberger and Spanberg, 2020). By this way, low dimension models can be estimated for explaining and forecasting one or more time series of interest.

DFA have been introduced to explain and forecast time series of interest in the presence of a large set of explanatory time series (Poncela et al., 2021). In practice, usefulness of dynamic factor models is apparent when the dimension is so large that vector autoregressive models are not able to handle the multivariate time series efficiently (Stock and Watson, 2016). Reduction of the available time series to few factors allows efficient and interpretable models to be estimated. Factor extraction has to be accomplished in such a way that only negligible or little amount of information be lost (Baragona and Battaglia, 2007).

DFA approach has been developed to deal with large panels of time series, when the number of variables becomes large compared to the number of observations (Wang et al., 2019). Each time series is represented as the sum of two components: the common component and the idiosyncratic component. The common component of the time series is driven by a few underlying uncorrelated and unobservable common factors (Stock and Watson, 2017). The estimated factors can be derived by applying a linear (time-invariant) filter to the data set (possibly with lags). The generalized dynamic factor model exploits the dynamic covariance structure of the data, the relation between different variables at different points in time. This makes an important difference to the forecasting model proposed by Stock and Watson (2002a, 2002b). Their forecast is based on a projection onto the space spanned by the static principal components of the data (Schneider and Spitzer, 2004).

The representation theory of the DFA firstly used by Forni and Reichlin (1998), Forni and Lippi (2001) and Forni et al., (2000, 2001, 2003, 2004, 2005). They have introduced the generalized dynamic factor model allowing for a limited amount of cross correlation among the idiosyncratic components and proposed this method for exploiting the potentially useful information in large panels of time series. Bai and Ng (2013) and Bai et al., (2016) described further analysis in their work.

Another dynamic factor model approach have been proposed by Kapetanios and Marcellino (2004), Kapetanios (2004), Camba-Mendez and Kapetanios (2005), Schumacher (2007) and Eickmeier and Ziegler (2008). There are several empirical researches that provide evidence of improvement in forecasting performance of macroeconomic variables using factor analysis Giannone and Matheson (2007), Van Nieuwenhuyze (2007), Cristadoro et al., (2005), Schneider and Spitzer (2004), Kabundi (2004), Doz et al., (2006, 2009), Stock and Waston (1991, 1998, 1999), Gosselin and Tkacz (2001) and Artis et al., (2005).

In this study, a leading indicator was tried to be created by investigating the effects on the BIST index with dynamic factor analysis using financial data. The sample period includes monthly data from 2010.M1 to 2022.M12.

2. Dynamic Factor Analysis

Consider n dimensional dataset of balance sheet data x_{nt} , described as:

$$x_{nt} = C_n F_t + \xi_{nt} \quad (1)$$

Where F_t is the r dimensional vector of static factors (with $r < n$) and C_n is an $n \times r$ coefficient matrix of factor loadings, and by:

$$(I - \Gamma L)F_t = Ru_t \quad (2)$$

where $(I - \Gamma L)$ is a matrix lag polynomial and R measures the impact multiplier effect of the q dimensional vector of dynamic factors (common systemic shocks) u_t on F_t . As shown by Forni et al. (2005), the higher is the number of static factors (measured by principal components) relative to the number of dynamic factors u_t , the higher is the degree of dynamic heterogeneity. In particular, as pointed out by Stock and Watson (2002a), the number of static factors includes both current and past values of the dynamic factors, since $r \leq q(s+1)$, with s being the number of lagged dynamic factors. Combining (2) and (3) we obtain the (structural form) impulse response profile for each component in the panel x_{nt} :

$$C(I - \Gamma L)^{-1}R \quad (3)$$

In order to retrieve estimates of the coefficient matrices entering in the impulse response profile given by (4), it can be proceed as follows. First, a consistent estimator of the static factor space is given by the first r principal components of x_{nt} , which is the panel of standardised observables (with mean zero and standard deviation equal to unity). Therefore, after demeaning the panel of raw data and by dividing each component by the sample standard deviation, the principal components are given by:

$$F_t = \frac{1}{\sqrt{n}} W_n' x_{nt} \quad (4)$$

where W_n is the $n \times r$ matrix having on the columns the eigenvectors corresponding to the first r largest eigenvalues of the covariance matrix of x_{nt} . The estimator of the matrix of factor loadings C_n is obtained by OLS regression of each of the observables in x_{nt} on the principal components F_t . The estimator of the coefficient matrix Γ is obtained by applying an OLS regression to each equation defining a VAR(1) on the principal components:

$$F_t = \Gamma F_{t-1} + \varepsilon_t \quad (5)$$

Finally, once Σ_ε is estimated, the sample covariance matrix of the reduced form innovation ε in (5), the structural form impact multiplier matrix R is given by KM , where:

- 1) M is the diagonal matrix having, on the diagonal, the square root of the q largest eigenvalues of Σ_ε , which is the covariance matrix of the residuals in (5).
- 2) K is the $r \times q$ matrix with columns given by the eigenvectors corresponding to the q largest eigenvalues of covariance matrix Σ_ε (Cipollini and Missaglia, 2007).

3. Data and Results

Technological progress and the increase in the speed of information dissemination have led to the fact that very different countries are affected by developments that are not dependent on their own domestic markets. In this context, the financial markets in the world have been connected to each other since the end of the 20th century, and with the acceleration of globalization, it has been seen that financial markets are affected by international movements

as well as domestic developments. In a developing economy such as Turkey, which is increasingly integrating with the global economy, the transfer of information between financial market indices, the degree of integration of these markets with each other, the effects of price and volatility spillover, the effects of different financial markets or economic agents other than the course of the local economy will change the direction of the stock market. Determination of its power in determining the investment is an important point for investment decisions.

The study, DFA was applied using R programming language for the monthly data of 38 financial indicators, which are thought to be effective on the BIST index, for the period 2010.M1-2022.M12. The aim here is to determine the factor scores of these monthly-based data, which is thought to guide the BIST index, to reveal the structure of factorization and to reduce the data. Table 1 lists the variables used.

Table 1: Variables List

X1	Bovespa	X20	CBOE Oil Index
X2	Dow Jones Index	X21	Russian RTS Index
X3	DAX Performance Index	X22	USD/TRY
X4	Euro Top 100	X23	EUR/TRY
X5	S&P 500	X24	EUR/USD
X6	ATX	X25	USD/JPY
X7	DAX FUTURE	X26	BRENT OIL
X8	MEX BOLSA FUTURE	X27	GOLD ONS
X9	NASDAQ 100 FUTURE	X28	Budapest Stock Exchange
X10	NIKKEI 225 FUTURE	X29	EURO/USD
X11	S&P 500 FUTURE	X30	MOEX
X12	Argentina Merval Index	X31	KOSPI 100
X13	FTSE100	X32	AEX HOLLAND
X14	BSE SOFIX	X33	ISEQ
X15	CSI 1000	X34	IBEX
X16	OMXC20	X35	EGX70
X17	OMXHelsinki	X36	BIST100
X17	CAC 60	X37	CBOE NDX VOLATILITY INDX
X19	NIKEI225	X38	Dow Jones Commodity (DJCI)

DFA is applied by R software and three factors are obtained as a result of analysis. Results are shown in Figure 1.

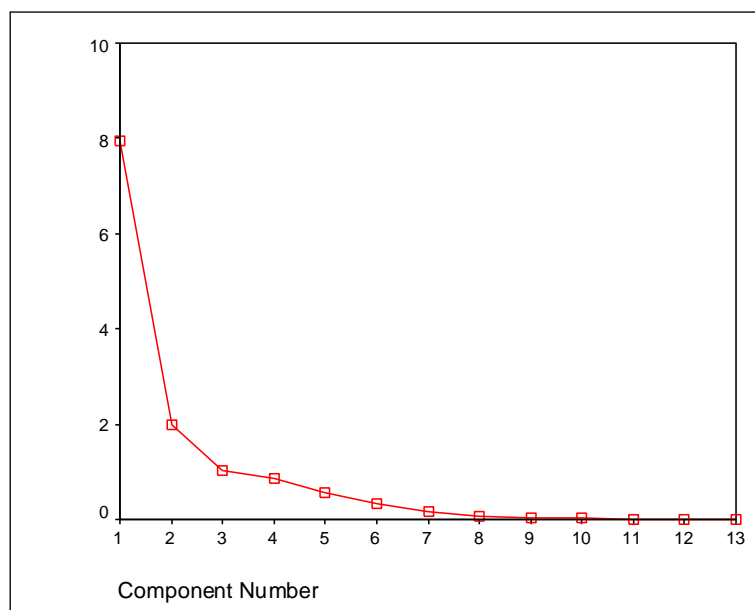


Figure 1: Eigenvalues of The Observed Time Series

By evaluating the conceptual meaningfulness of data for obtained factors, the first factor is called as stock markets, the second one as exchange rate and the third one as commodity.

Table 2 : Factor Loadings Estimates

	Factor 1	Factor 2	Factor 3		Factor 1	Factor 2	Factor 3
1	.848	-.002	.068	20	.779	.160	-.279
2	.776	-.147	.099	21	.894	-.058	-.058
3	-.045	.662	.074	22	.015	.715	-.317
4	.877	-.038	-.203	23	.842	.055	-.112
5	.866	-.089	.114	24	.499	-.299	.448
6	.214	.415	-.568	25	-.066	.658	-.199
7	.851	-.025	.012	26	.472	.152	-.017
8	.239	.018	.639	27	.435	-.257	.639
9	.079	.438	-.444	28	-.087	.647	.212
10	.464	.117	.009	29	.894	-.009	-.106
11	.092	.171	.804	30	.115	.767	.222
12	-.135	.682	-.033	31	.385	.309	.148
13	.893	-.076	.049	32	-.021	.732	.256
14	.060	.789	-.031	33	-.080	.539	.003
15	.316	.353	.104	34	.091	-.606	.017
16	-.087	.781	-.008	35	-.156	.635	-.009
17	.064	.047	-.062	36	-.153	.664	-.062
18	.793	-.114	-.076	37	-.149	.717	.025
19	.043	.581	.273	38	-.141	.699	-.050

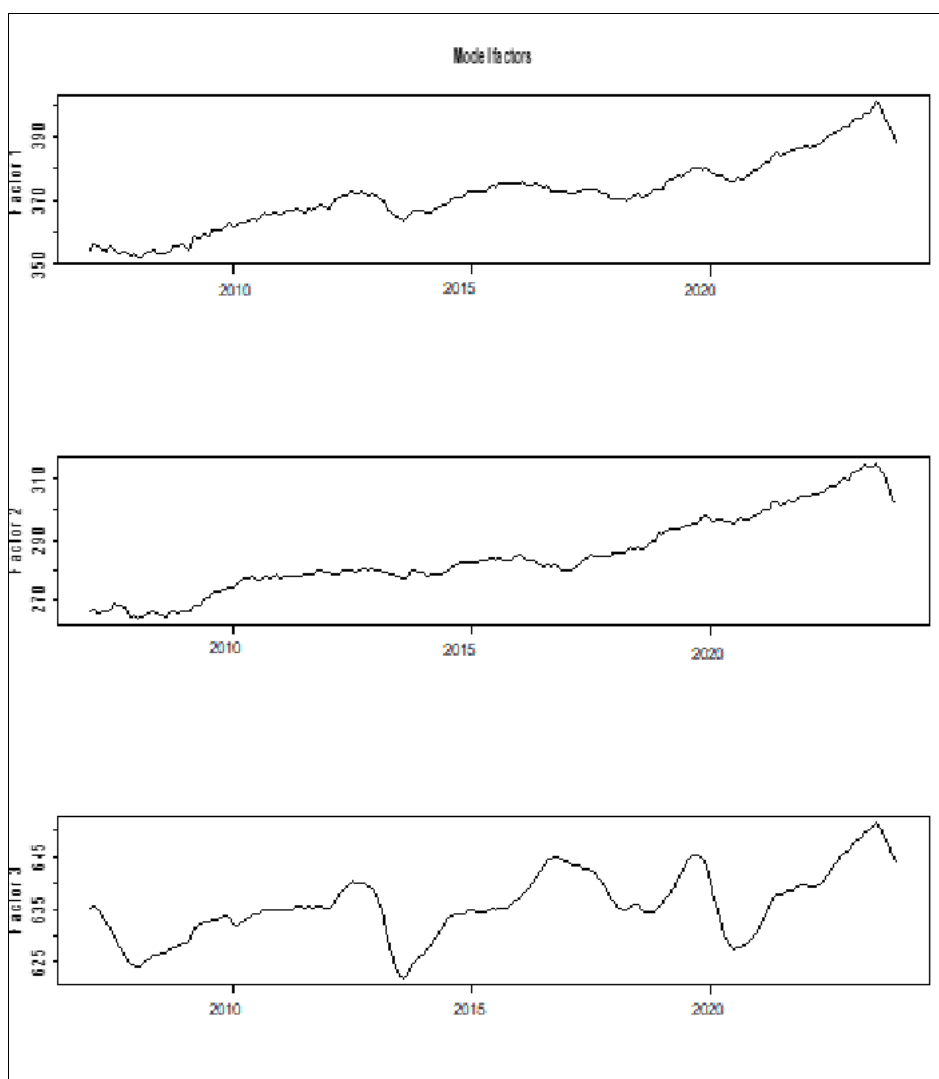


Figure 3: Dynamic Factor Model Estimation

BIST index and the prices of traded stocks are affected by three main factors, as in other world stock markets; the state and course of the world economy, the state and course of the local economy, and the state and performance of the sector/firm. Any development in the Global Economy will affect all countries' economies to a greater or lesser extent, as well as directly or indirectly affect related or all companies in that country. The need for producing accurate forecasts and reduce of key economic and financial variables has been a strong driving force for empirical research. A clear understanding of the state of macroeconomic and financial activity is important to economic policy making. DFA is a multivariate time-series analysis technique used to estimate underlying common patterns in a set of time series.

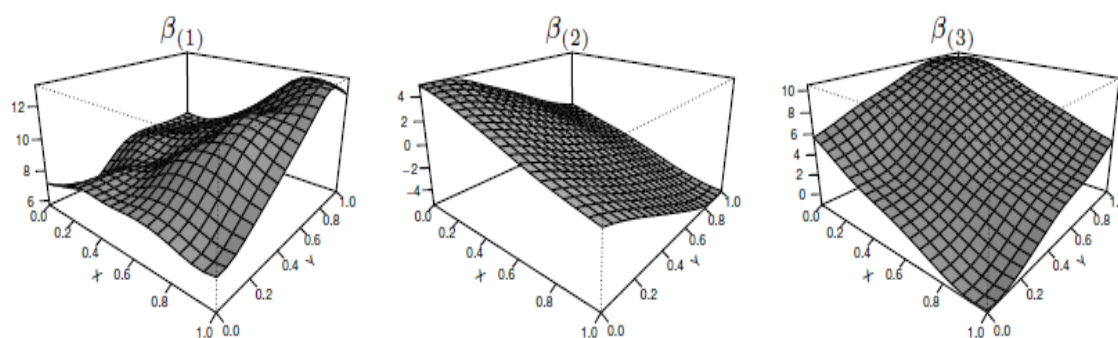


Figure 2: Gaussian processes for the three columns of the factor loadings matrix

4. Conclusion

In traditional factor analysis, for a given small size of the cross-section n , the model can be consistently estimated by maximum likelihood. It is assumed that there is no cross-correlation among the idiosyncratic components at any lead and lag (Hörmann and Nisol, 2020). This assumption allows for identification of common and idiosyncratic components but represents a strong restriction (Barigozzi and Cho, 2020). Recent advances in the theory of DFA have generalized the idea of factor analysis to handle less strict assumptions on the covariance of the idiosyncratic elements and proposed non-parametric estimators of the common factors based on principal components, which is feasible for n large (Jin et al., 2021). Under suitable technical conditions, it is possible to estimate the dynamic factors consistently in an approximate dynamic factor model when the time series and cross-sectional dimensions are large (Bai and Ng, 2021). Therefore, extensions of DFA to large n can be viewed as a particularly efficient way of extracting information from a large number of data series (Chen et al., 2021). Furthermore, these models differ from the classic factor model in that they allow the idiosyncratic errors to be weakly serial and cross-sectional correlated to some extent.

The main purpose of FA is to make the data set easier and more explicable by shrinking it. As a result of the analysis, a general variable called a factor is created. Based on the directly observed variables in the FA analysis, factors that cannot be directly observed are determined (Choi and Jeong, 2019). FA, which has a wide place in various application areas, is insufficient in the analysis of data types with time series characteristics as a result of the fact that the assumptions are not realised (Barigozzi and Luciani, 2022). When the literature is examined, it is seen that the method is more likely to provide assumptions for cross-sectional data (Fiorentini et al., 2018). DFA, which can work with fewer assumptions for non-stationary economic and financial data and can also make effective discriminations with small samples, has gained priority especially in studies in the field of finance sector (Despois and Doz, 2020). While the DFA method is suitable when it comes to modeling the dynamic structure of the variables under consideration, time series factor analysis is preferred in the opposite cases. In fact, many practitioners see the determination of the dynamic structure as a difficult step and prefer directly to DFA (Yu et al., 2018; Xiong and Pelger, 2023).

In the study, 38 financial variables that are thought to shape the BIST index were studied. The aim here is to identify the factors that can be a leading indicator of the index and to distinguish the variables that can create an early warning system. As a result, these variables were reduced under 3 factors. This result reveals the importance of following the arguments of both the local economy and the world financial markets in investment decisions.

In terms of financial stability, it is very important to understand the interrelationships between various market arguments and to determine the complex nature of these interrelationships. In this context, understanding the connections of the volatility seen in the returns in the markets and understanding the factors that will protect them from the market risks arising from the shocks transmitted within the market or between the markets are guiding for investors.

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