

Regional and Business Studies



Regional and Business Studies

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WHEN THE WELLS RUN DRY: EMPIRICAL EVIDENCE ON WATER STRESS, GOVERNANCE QUALITY AND HUMAN DEVELOPMENT IN SUB-SAHARAN AFRICA

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ABSTRACT

The Sub-Saharan Africa region is faced by a severe and multidimensional water crisis threatening to undermine sustainable development efforts across the region. Despite the global commitment to SDG 6, 387 million from SSA by 2020 had no basic drinking water service access with pronounced disparities between urban and rural areas. Accordingly, whereas existing studies have explored water scarcity in relation to population pressures, human activities, and climate change, the relationship between human development, water stress and environmental governance quality remains underexplored. Specifically, the study aimed: to determine the influence of level of water stress on human development in SSA; and to establish the influence of environmental governance quality on human development in SSA. The study used secondary data from the World Bank for 24 SSA countries spanning 17 years from 2005 to 2021. The study employed Random-effects GLS regression using Stata 17. The model demonstrates that both water stress and environmental governance quality explain about 58.80% of the variation in human development overall. Similarly, both water stress and environmental governance quality explain approximately 40.33% and 37.60% variation in human development between and within the 24 Sub Saharan Africa countries respectively. The findings show how much both the level of water stress ($\beta=0.03092$, p value = 0.000) and the quality of environmental governance ($\beta=0.03618$, p value = 0.000) positively stress-impacted and influenced human development. This reveals the need for more robust environmental governance and integrated water resource management in Sub-Saharan Africa.

Keywords: human development, water stress, environmental governance quality, panel

INTRODUCTION

Water stress in the form of water withdrawal intensity is a major challenge that impacts sustainable development. In the context of the Sub-Saharan Africa (SSA) region, marked with high population growth, poor environmental governance, and climate change, water stress in the form of water scarcity have been heightened (Nyika & Dinka, 2023). The SSA region is also marked with a multi-faceted water crisis in the form of physical and economic water scarcity in arid and semi-arid zones, and in resource-constrained areas, respectively. In a similar manner, water crises in the SSA region are also marked with

quality-induced water scarcity in the form of water pollution and contamination (Jones *et al.*, 2024). Despite the measures in place to mitigate the effects of climate change, most countries in the SSA region continue to experience heightened water stress in their water resources due to high demands from the industrial, domestic, and agricultural sectors, and poor water management practices (Kadigi *et al.*, 2019). Nevertheless, the nexus between human development, water stress, and quality of environmental governance is yet to be adequately investigated despite its importance in informing policy development and sustainable management of resources.

About half of SSA's population have no access to basic drinking water service, and this has been shown to have significant differences when comparing rural and urban areas (Terefe *et al.*, 2024). This situation has been further exacerbated by its linkages to other development challenges such as poverty, food security, and lack of capacity within institutions. In this regard, recent data has indicated that the poverty rate measured by headcount ratio (% of population) for 2019 was 47.5% (World Bank, 2025). On a similar note, Abdou & Rajab (2023) contended, "As countries in Sub-Saharan region embark on economic growth and social development, these countries have witnessed increasing water demand, hence increasing pressures on water resources." In this regard, SSA region presents one of these challenges as approximately 387 million people have no access to basic drinking water service as of 2020 (World Bank Group, 2024). In this case, it can be noted that Sustainable Development Goal number six by the United Nations has placed emphasis on ensuring sanitation and water for all. Nevertheless, this goal has not been achieved in SSA due to lack of capacity within institutions and water demand pressures.

The intensity of water withdrawal is defined as the volume of freshwater abstracted from natural sources over the total renewable water resources - which is a key indicator of water stress among the Sub-Saharan African states (Zhang *et al.*, 2022). Generally, the states of SSA face a comparable level of hydrological risk conditions but with varying degrees of intensity and causes. On the African continent, it has been noted that at least 14 states of the Sub-Saharan region are under high water stress with withdrawal levels nearing the limits of sustainability (Dinka & Nyika, 2024). Moreover, states in the SSA region are also facing very rapid population increase; hence, the stress on the limited water resources keeps escalating with concerns being raised over its sustainability (Abdou & Rajab, 2023).

The current literature emphasizes the rising water crisis in SSA, where research link water scarcity to population pressures, economic activities, and climate change (Filho *et al.*, 2022; Ofori *et al.*, 2021). Notably, Ladi *et al.* (2021) brought forth water poverty index as a conceptual tool to interpret how water scarcity affects human development in a multidimensional framework. Likewise, other research such as Mishra *et al.* (2021) also established the concept of 'water security' as a sine qua non for human development, claiming that a lack of proper access to water resources hinders economic development. Morante-Carballo *et al.* (2022) assert that water scarcity affects agricultural productivity, health, and economic activities. Notably, Morante-Carballo *et al.* (2022) study found a negative relationship between water stress indicators and other human development indicators. Nevertheless, the relationship between water stress and human development is a topic of controversy, where some research claim that a high level of

human development is positively correlated to high demand for water resources due to increased economic activities resulting from industrialization and urbanization processes (Wang *et al.*, 2022). Likewise, other research studies such as Chang & Zhu (2020) proved that good governance and technological advancements make it possible to separate water use from development.

Accordingly, the role of environmental governance in the management of water resources has also received scholarly attention. As a result, Megens & Warner (2025) conceptualized water governance as a multi-level system encompassing formal institutions, informal norms, and stakeholder interactions that collectively shape water resource management outcomes. Particularly, Jiménez *et al.* (2020) in their study on Unpacking Water Governance, they found that water governance quality significantly influences the effectiveness of water management policies. However, in Sub-Saharan Africa, studies indicate that weak enforcement of water policies, fragmented institutions and corruption are associated with unsustainable water use (Tariq & Zhang, 2021). Despite existing studies that have been conducted, the empirical evidence regarding the relationship between governance quality and water stress remains limited with focus in SSA.

In the view of the identified gaps, this article seeks to address these gaps by determining the link between human development, water stress and environmental governance quality in selected SSA countries. Similarly, the significance of this study extends beyond academic inquiry to practical policy formulation, resource allocation, and environmental management across SSA. In particular, through analysis of the interrelationships, the study aimed to contribute insights that could guide regional efforts towards achieving sustainable development goal 6, regarding clean water and sanitation, and other related goals for sustainable development.

Problem Statement

The SSA region faces a severe and multidimensional water crisis that threatens sustainable development in the region. Despite the global commitment to achieving SDG 6, a total of 387 million SSA citizens in 2020 lacked basic drinking water service access, with a large gap between urban and rural areas. This water crisis is worsened by population growth, climate change, and a lack of good governance structures, which has significant implications for sustainable development.

Accordingly, whereas existing studies have explored water scarcity in relation to population pressures, climate change, and human activities, the association between water stress, human development, and environmental governance quality remains underexplored. Regarding the relationship between water stress and human development, existing literature presents conflicting perspectives with some studies suggesting that water stress constrains economic growth and social progress, while others suggest that higher human development levels may increase water demand through industrialization and urbanization. Similarly, while environmental governance quality has been conceptualized as crucial for water resource management, empirical evidence regarding its relationship with human development in SSA remains limited.

As a result of the identified gaps, this paper aims to determine the link between human development, water stress, and environmental governance quality in selected

Sub-Saharan African countries (*Appendix 1*). This paper analyses the relationships between human development, water stress, and environmental governance quality in 24 countries in SSA between 2005 and 2021, aiming to address these knowledge gaps and provide insights that could guide policy formulation regarding environmental management practices across the SSA region to help the region in achieving SDG 6 and related sustainable development objectives.

Aim

The study examined how the level of water stress and environmental governance quality influence human development in SSA.

Specific objective

1. To determine the influence of the level of water stress on human development in SSA.
2. To establish the influence of environmental governance quality on human development in SSA.

Structure of the Paper

The paper is organized into six large sections to ensure the proper flow of the paper. Section I includes study background, study problem, and study objectives to focus on water stress, human development, and environmental governance for Sub-Saharan Africa. Section II includes (Literature Review), which includes the compilation of different studies regarding water stress, quality of environmental governance, and linkages of water stress to human development, and different gaps which have not been addressed yet by any empirical study. Section III includes the methodology which presents research design, data, and techniques used to measure water stress, quality of environmental governance, and human development. Section IV presents the findings which includes different data and statistics regarding trends and observations made for different countries of Sub-Saharan Africa. Section V discusses the results, which includes explanation and interpretation of findings regarding different studies carried out, including various aspects of policies covered, including limitations. The conclusion has been included in Section VI, which includes a summary of different findings and different future directions to be taken regarding water security and development for Sub-Saharan Africa.

Literature Review

Human Development and Water Stress

Water scarcity in the Yellow River Basin (YRB) was examined in relation to future human activities and climate change to forecast water scarcity and its driving factors using the Water Use-to-Availability Ratio (WUAR) as a criterion (Omer *et al.*, 2020). The study coupled climate change scenarios (RCP8.5 & RCP4.5) and the hydrological model (SWAT) and used statistical techniques such as correlation analysis and regression analysis to examine relationships between water scarcity, climate-related factors and human factors such as land use change and consumptive water use. Results showed that future water scarcity in YRB is forecasted to increase, especially

in its lower course, where human factors such as cropland expansion and urbanization have a greater weight than climate change. The important limitation of *Omer et al. (2020)* study is its regional specificity in China and its limited applicability to other regions in general and in Sub-Saharan Africa (SSA) in particular, where water scarcity is exacerbated by governance problems and low human development indices. Although *Omer et al.'s (2020)* study concentrates on human factors as drivers of water scarcity in YRB, its results do not specifically examine relationships between water scarcity and human development as in SSA's case in which water scarcity is a critical issue in addition to governance problems and low human development indices. The study addresses these gaps by empirically examining how governance quality affects relationships between human development and water scarcity in SSA to provide comparative insights to *Omer et al. (2020)* study in YRB.

The role of industries in aggravating the scarcity of water and the opposing effects of such conditions on human and environmental health, particularly regarding the release of untreated industrial wastewater chock-full of toxic organic and inorganic compounds, was investigated by *Chowdhary et al. (2020)*. The authors aimed to highlight the effects of industries on water resources, emphasizing the relationship between environmental degradation, water pollution, and human health. The method used was a thorough review of the literature, including case studies, to evaluate the types of pollutants from industries such as distilleries, tanneries, and textile mills, and their pathways into water resources. The results showed that the entry of effluents from industries has a significant effect on water scarcity because it introduces toxic materials such as heavy metals, phenolics, and dyes, leading to the destruction of aquatic life, soil infertility, and cancers, as well as dermatitis and gastrointestinal infections in human populations. A major gap in empirical studies that was noted was that there were no up-to-date studies on the socio-economic effects of water pollution from industries in newly developing areas, particularly in SSA, where water scarcity, caused by the rapid industrial growth and poor environmental policies, retards socio-economic development. This study closes the gap in that it investigates the relationship between water scarcity and human development in SSA, where the effects of rapid growth of industries and poor environmental policies contribute to water scarcity, thus hampering socio-economic development.

A thorough analysis of human responses to water scarcity triggered by climate change in the African continent has been carried out by *Filbo et al.* in 2022 in Sub-Saharan Africa (SSA). The purpose of the analysis was to review the knowledge of water scarcity trends and its impacts on different sectors and adaptation measures using a mixed methods approach, which combines the Falkenmark Water Stress Indicator, EM-DAT disaster database, and 240 articles from the Global Adaptation Mapping Initiative (GAMI) and other databases. The result showed that the most common response actors were household/autonomous actors such as individuals and local governments who responded to water stress using behaviour-related, technological, and nature-based methods. However, most of these responses were minor modifications of already practiced methods, which show that the adaptations are not very substantial and lack proper institutional structures. The paper has found that the current empirical research has many gaps, such as the under-representation of vulnerable groups and inadequate incorporation of indigenous knowledge into

adaptable measures. This paper fills these gaps by critically analysing the relationship of human development and water stress in SSA.

Environmental Governance Quality and Human Development

The connection between environmental governance quality and human development in SSA has been underexplored in the literature, with existing studies primarily focusing on high water-stress regions outside Africa on corporate water disclosures.

The extent and quality of corporate water management disclosure in extremely high water-stress countries were examined using a framework analysing institutions across different tiers to assess micro (company), meso (stock exchange), and macro (country) influences (Farooq *et al.*, 2025). Their study utilized a GRI 303-based index in assessing top listed firms' disclosures in 12 stock exchanges over five years. The study found that disclosure rates of water and quality continue to be relatively low, with only marginal progress observed. Key drivers included robust corporate governance (CG) at the micro level, regulatory stringency levels and advocacy at the meso level, and cultural dimensions at the macro level, though country-level governance quality surprisingly had a negative impact on disclosure quality in water-sensitive industries. While this study provides insights into institutional pressures shaping water disclosures, it primarily focuses on non-African contexts, leaving a gap in understanding of how environmental governance quality interacts with human development in SSA, where institutional frameworks and resource challenges differ significantly.

Research on the efficiency of water environmental governance in China's Yangtze River Delta region employed DPSIR-TOPSIS & Social Network Analysis (SNA) techniques to analyse the involvement of governments, enterprises, and citizens in environmental governance between 2006 and 2017 (Lin *et al.*, 2022). The findings showed that efficiency of environmental governance increased over the years due to government policies, technological development, and public engagement, although inequalities among cities were also on the rise. Although this study provides important information on multi-stakeholder environmental governance and regional collaboration, it focuses on a very industrialized and government-regulated environment. This is quite opposite of the situation in Sub-Saharan Africa, where environmental water scarcity is worsened by climate change and very rapid urbanization. The major research gap in the present topic is that no studies exist on the efficiency of environmental governance in less resource-rich regions. Another gap is that the DPSIR-TOPSIS approach needs to consider the specific combination of informal and formal environmental governance systems in Sub-Saharan Africa. This study will close these research gaps by applying DPSIR-TOPSIS & including the specific socio-political factors and people's water resource governance practices in Sub-Saharan Africa.

The research conducted in China, which comprehensively assessed the scarcity of water at the national level, incorporating both the quality and quantity aspects of water scarcity, was conducted by Ma *et al.* (2020), an essential aspect previously omitted in the assessment of water scarcity at the macro level, which only considered the quantity of water. The research sought to quantify the effect of poor water quality on water scarcity on various time and spatial scales, employing high-resolution data on water availability water quality indicators (COD, NH₄⁺-N, and EC), as well as water withdrawals according to sectors. The research used the technique of

downscaling data from the provincial level to the grid cell and the basin levels, using the dilution method to convert water quality constraints into scarcity measures of water quantity (WSqua, WSpol, and WScom). The research showed the effect of water pollution on water scarcity, especially in North China, where there is both quantity and quality scarcity of water on an annual basis, as well as in South China, where there is seasonal scarcity of water due to quality deterioration. Over half of the population of China is affected, indicating the urgency of the combined management approach. An essential empirical aspect previously omitted in the research on water scarcity at the macro level was the lack of global application of the assessment due to the lack of water quality data, especially SSA. This research is essential in indicating the need to incorporate the aspect of quality, although it is limited to the assessment of China, which cannot be directly generalized to SSA because of the vast differences in environmental management and data.

The study on the effectiveness of water governance in three river basins in Latin America-Guandu (Brazil), Alto Mayo (Peru), and Bogotá (Colombia)-was also conducted by *Vollmer et al.* (2020) using Freshwater Health Index (FHI). They sought to quantitatively measure the quality of governance through stakeholder surveys, which were perception-driven. Their methodical approach comprised administering a Likert-type survey to various stakeholders, which were further subjected to a weighting process via the Analytic Hierarchy Process (AHP), a multicriteria analysis tool was used to identify the relative importance of components. Results indicate low scores for overall governance (Alto Mayo = 38, Guandu = 26, Bogotá = 43), which suggest systemic deficiencies, especially in terms of financial resources, monitoring, and stakeholder engagement. Interestingly, a difference in perceptions regarding governance performance was observed among government and non-governmental stakeholders, where the former tended to rate more positively. One major research gap identified in the literature analysis is the relative unaddressed area regarding the relationship between biophysical outcomes, such as water stress, and the role of governance quality, which has been unaddressed comparatively among regions with disparate hydrological and political systems. This study contributes meaningfully to filling the research gap regarding the relationship between environmental governance quality and human development in the SSA regions.

MATERIALS AND METHODS

Research Design

A correlational research design was used in this study to determine the influence of water stress, and environmental governance quality on human development. According to *Oso & Onen* (2009), this design helps in predicting variables from other variables, and establishing whether and to what level, a relationship exists between variables. The paper sought to determine the following research hypotheses:

H_0 : Water stress has no significant influence of human development in SSA.

H_1 : Environmental governance quality has no significant influence on human development in SSA.

Econometric Model

The study employed panel data analysis and the relationship among the variables (1).

$$HDI_{it} = \beta_0 + \beta_1 WS_{it} + \beta_2 EGQ_{it} + \varepsilon_{it} \quad (1)$$

Where:

HDI_{it} Human Development Index

WS_{it} Water stress in country i at time t

EGQ_{it} Environmental Governance Quality in country i at time t

ε_{it} Error term

β_1, β_2 regressors of WS and EGQ

Measurement of variables

Water Stress

Water stress measured as ratio of freshwater usage to total available freshwater resources, is an indicator that assesses the pressure exerted on a country's freshwater resources by human water use (*World Development Indicators*, 2025). The study used annual level of water stress data for the period 2005 to 2021.

Human Development

Human Development refers to the progression of enhancing individuals' liberties, broadening their prospects, and elevating their overall quality of life. The study used individual country -level annual human development index data for the period 2005 to 2021.

Environmental Governance Quality

Environmental Governance Quality refers to the effectiveness of a country's policies, institutions, and regulatory frameworks in managing natural resources and protecting the environment in a sustainable and equitable manner (*World Development Indicators*, 2023). Environmental governance quality has been measured using the CPIA Policy and Institutions for Environmental Sustainability Rating from the World Development Indicators (*World Development Indicators*, 2023). The CPIA rating scale is 1 to 6, with 1 signifying the lowest and 6 the highest. The rating measures the extent to which a country is able to positively manage and sustain the use of its natural resources, protect the environment, and firmly regulate and enforce policies. More specifically, the rating measures the formulation of policies, the quality of regulations, the capacity to enforce regulations, and the inter-institutional collaboration. The CPIA rating is appropriate for empirical, cross-country studies and time-series studies. The study used individual country -level annual institutional and policy data for environmental sustainability rating for the period 2005 to 2021.

Data Analysis

The paper employed inferential data analysis including regression and correlation analyses. The analysis was conducted using STATA software version 17. Alternative specifications of the models were evaluated to verify the estimated relationships.

Apart from Unit root tests, the Hausman specification test and fixed-effects estimation was applied. Hausman specification test was used to establish the preferred model. The consistency of the coefficient signs and statistical relevance across specifications denotes the robustness of the primary results.

RESULTS AND DISCUSSION

Descriptive Statistics

As depicted in *Table 1*, the descriptive statistics reveal notable patterns in the study variable across 24 countries over the period 2005–2021. In particular, human development, proxied by Human Development Index had a mean of 0.482 and a median (p50) of 0.49, which shows a relatively low human development level within the SSA region's development challenges. Similarly, the standard deviation of 0.069 indicates moderate variability across countries and over time. Moreover, the stability in the HDI distribution depicted by skewness (0.077) and kurtosis (0.083) reflect persistent structural constraints in the region. Additionally, the level of water stress demonstrates substantial heterogeneity with a mean of 7.7 and a considerably lower median (5.1) suggesting that some countries within the region are exposed disproportionately high-water stress levels. This is supported by the large standard deviation of 8.53, interquartile range (8.15), range (46.06). Notably, the wide gap between 75th percentile (10.19) and the maximum value (46.09) reflect acute water scarcity in some countries within the region. Furthermore, environmental governance quality demonstrates intermediate variability indicated by a mean of 3.2 and a standard deviation of 0.46. Accordingly, the relatively narrow range (2) and interquartile range (0.5) suggest that, although differences exist, environmental governance quality remains somewhat clustered across the region.

Table 1: Descriptive Analysis

	Human development	Level of water stress	Environmental governance quality
Mean	0.482	7.713	3.235
p50	0.490	5.155	5.155
SD	0.069	8.538	0.465
IQR	0.1	8.15	0.5
Range	0.31	46.06	2
p25	0.43	2.04	3
p75	0.53	10.19	3.50
Min	0.3	0.03	2
Max	0.61	46.09	4
Skewness	0.077	0.083	0.630
Kurtosis	0.083	0.065	0.466
Observation	408	408	408

Testing for Stationarity

The study employed Harris–Tzavalis test for stationarity given its suitability for datasets with few/small time periods and larger panel number (Karavias & Tzavalis, 2014). This is premised on the assumption of fixed time periods while panel numbers tend to be infinite. Accordingly, Table 2 shows that all the variables were non-stationary at level as demonstrated by the statistic, z and their respectively p values which are greater than 0.05. Contrastingly, all the variables were stationary at first difference as depicted by the statistic, z and their respectively p values which are less than 0.05.

Table 2: Harris-Tzavalis Unit Root Test

H0: Panels contain unit roots					Number of panels = 24		
Ha: Panels are stationary					Number of periods = 17		
AR parameter: Common					Asymptotics: N $\rightarrow$ Infinity		
Panel means: Included					T Fixed		
Time trend: Not included							
Level					First Difference		
	rho	Statistic	z	p-value	Statistic	z	p-value
HDI		0.9068	2.0946	0.9819	0.1150	-19.1183	0.0000
WS		0.9902	4.4738	1.0000	0.2296	-16.0262	0.0000
EGQ		0.8004	-0.9384	0.1740	-0.0398	-23.2947	0.0000

Correlation analysis of Study Variables

Accordingly, Table 3 below shows the correlational analysis. Specifically, results demonstrate that human development exhibits a weak but nonetheless statistically significant positive association with the level of water stress ($r = 0.1131$, $p = 0.0224$). The weak but significant positive correlation implies that higher human development levels are marginally related to increase water stress. Similarly, human development demonstrates a stronger and highly significant positive correlation with environmental governance quality ($r = 0.3028$, $p < 0.001$). Additionally, the level of water stress shows a modest yet statistically significant positive association with environmental governance quality ($r = 0.1456$, $p = 0.0032$).

Table 3: Correlation Matrix

	Human development	Level of water stress	Environmental governance quality
Human development	1.000		
Level of water stress	0.1131 (0.0224)**	1.000	
Environmental governance quality	0.3028 (0.000)**	0.1456 (0.0032)**	1.0000
Correlation coefficients are shown in the upper row for each variable pair. p -values are reported in parentheses below each coefficient. Statistical significance is denoted as ** = Significant at 5% level ($p < 0.05$)			

Hausman Specification Test

The study conducted a Hausman test to determine the appropriate model for fixed effects and random effects by testing whether the individual-specific effects are correlated with the regressors. As indicated in *Table 4*, the results show that the random effect model gave consistent and efficient estimates since the p value of 0.1129 is greater than 0.05.

Table 4: Hausman Test Results

Coefficients				
	(b)	(B)	(b-B)	$\sqrt{\text{diag}(V_b - V_B)}$
	fixed	random	Difference	Std. err.
d.ws	043363	030929	012434	.0006007
d.egg	035263	0361777	0009147	.0005832
b = Consistent under H0 and Ha; obtained from xtreg. B = Inconsistent under Ha, efficient under H0; obtained from xtreg. Test of H0: Difference in coefficients not systematic $\chi^2(2) = (b-B)'[(V_b - V_B)^{-1}](b-B) = 4.36$ Prob > $\chi^2 = 0.1129$				

Random-effects GLS Regression Results

As represented in *Table 5*, both the level of water stress and the environmental governance quality significantly and positively impact human development. The model demonstrates that both water stress and environmental governance quality explain about 58.80% of the variation in human development overall. Similarly, both water stress and environmental governance quality explain approximately 40.33% and 37.60% of the variation in human development between and within the 24 Sub-Saharan African countries, respectively. In particular, the level of water stress ($\beta = 0.03092$, p value = 0.000) exhibited direct and significant relationship with human development. The positive coefficient implies that for every unit increase in level of water stress, human development increases by 0.031 points. Similarly, environmental governance quality ($\beta = 0.03618$, p value = 0.000) also demonstrated an even stronger positive relationship with human development. In particular, with a one-unit improvement in governance corresponding to a 0.036-point increase in HDI. Additionally, a high fraction of variance attributable to country-specific effects ($\rho = 0.8198$) indicates substantial unobserved heterogeneity across nations that persists over time, highlighting the importance of country-specific factors beyond the measured variables.

The GLS regression results showed that both levels of water stress and environmental governance exhibited direct and significant influence on human development across the 24 countries in SSA. Specifically, the statistically significant positive relationship between human development and water stress ($\beta = 0.03092$, p value = 0.000), aligns and expands upon the findings of the previous studies. Accordingly, *Omer et al. (2020)* demonstrated that anthropogenic factors, such as land-use changes and urbanization, exacerbate water stress, but their focus on the Yellow River Basin overlooked the unique governance and developmental challenges present in Sub-Saharan Africa (SSA).

Table 5: Random-effects GLS Regression Results

Random-effects GLS regression			Number of obs	=	408
Group variable: id			Number of groups	=	24
R-squared:			Obs per group:		
Within = 0.4033			min = 17		
Between = 0.3760			avg = 17.0		
Overall = 0.5880			max = 17		
corr (u_i, X) = 0 (assumed)			Wald chi2(2) = 95.86		
			Prob > chi2 = 0.0000		
d.hdi	Coefficient	Std. err.	z	P>z	[95% conf. interval]
d.ws	.0309290	.0868792	3.56	0.000	.0013910 .0047948
d.egg	.0361777	.0042841	8.44	0.000	.0277811 .0445744
_cons	.3414153	.0192623	17.72	0.000	.3036619 .3791687
sigma_u	.06202011				
sigma_e	.02907444				
rho	.8198304 (fraction of variance due to u_i)				

The positive correlation between water stress and human development means that, in the short term, development activities in Sub-Saharan Africa are likely to create new tensions regarding the use of water, rather than reduce them. This can be explained in terms of water-use intensity and the Environmental Kuznets Curve (EKC) hypothesis. In the early stages of development, water stress in a given area principally derives from an increase in the withdrawal of water for multiple uses and the subsequent associated pollution that results, particularly from the various activities of the developed economy (i.e., the service, commercial, and industrial sectors) in conjunction with the major urban centers and the agricultural sector. This has also been observed in multiple developing countries where development, at least in the early stages, led to worsening environmental issues at hand until they were positive for the development of the country (*Wang et al.*, 2022). Thus, the positive relationship in question does not mean that water stress creates a conducive environment for development, rather it indicates that the current development paths in SSA are still very water dependent and only partially decoupled from the use of resources.

The findings of this study demonstrate that higher human development, which is often associated with industrialization, urban expansion and agricultural intensification may inadvertently exacerbate demand for water and pollution. This supports *Chowdhary et al.* (2020) argument that industrial activities degrade water quality, particularly in regions with weak regulatory enforcement. Although *Chowdhary et al.* (2020) highlighted industrial pollution in their research, this study suggests an even broader socio-economic framework, in which development processes, and severe institutional voids, may catalyze water stress.

This also aligns with *Filbo et al.* (2021) argument as autonomous localized actions addressing water shortage in SSA, leaving much to be desired in terms of systemic institutional resolutions. Therefore, water stress and human development findings in the 24 SSA countries illustrate that human development, in the absence of

considerable and effective institutional frameworks, and the practice of integrated water management systems, simply cannot be operationalized in the context of water stress.

In the same line, the study found that environmental governance quality and human development have a statistically significant positive relationship ($\beta = 0.03617$, $p\text{-value} = 0.000$). This helps close a significant gap, particularly in SSA, where this has not been as comprehensively documented. Even when *Farooq et al.* (2025) examined corporate water disclosures in countries with high water stress, their lack of focus on Africa, and the surprising negative effect of country-level governance quality and disclosure quality, provided an impetus to develop such analyses in the context of Sub-Saharan Africa. As such, *Liu et al.* (2022) and *Ma et al.* (2020) emphasized centralized policies and technological solutions in China, which may not translate to Sub-Saharan Africa's resource-constrained environments, where bottom-up approaches and traditional knowledge play pivotal roles. Similarly, *Vollmer et al.* (2020) further highlighted governance deficiencies in Latin America but left unanswered how these dynamics manifest in Sub-Saharan Africa. Consequently, the results of this study demonstrate that incremental improvements in environmental governance quality enhance human development which aligns with DPSIR-TOPSIS framework's emphasis on adaptive governance (*Wu & Liu*, 2022). However, the findings of this study diverge from those of *Farooq et al.* (2025) on governance's negative role in disclosures.

Though short-term benefits such as greater industrial production, urban job creation, and agricultural productivity will occur with increased water usage, the long-term sustainability of these benefits is in jeopardy. Uncontrolled water withdrawal and pollution will create ecosystem degradation, water scarcity, and increased development risks linked to climate change. These issues create a clear trade-off in Sub-Saharan Africa (SSA). Increases in short-term human development in the region due to the use of water-intensive practices will harm long-term development potential without improvements in water management and governance.

CONCLUSIONS

The study demonstrated that, in Africa's Sub-Saharan region, human development is positively influenced by both water stress and the quality of environmental governance. There is, however, sustainability pressure, that must be taken into consideration. Although development gains are evident, there is increasing stress on water resources which adds to the development-related critiques of being unsustainable, and that development pathways will lead to water resource depletion (*UNEP*, 2023; *World Bank*, 2024).

Country-level heterogeneity suggests that institutional, environmental, and socio-economic forces although often invisible, play a critical role in shaping development outcomes. This exemplifies the limitations of one-size-fits-all policy prescriptions and underscores the importance of nuanced, adaptive, participatory and culturally sensitive governance systems. In line with the new tide of sustainability around SDG 6 and the 2030 Agenda, results provide strong support for the idea that development

planning will not lead to human development in a sustainable manner without solid environmental governance and integrated water resources management in place.

The present study indicates an emerging global consensus. Economic and social advancement, without effective governance and sustainability approaches, can impede long-term development prospects. Enhancements in environmental governance are not a matter of choice; they are necessary for sustaining human development in water-scarce regions such as Sub-Saharan Africa.

Recommendations

Given the distinct relationship between water stress, the quality of environmental governance, and human development, it is necessary that the institutional frameworks in Sub-Saharan African region be strengthened to improve transparency and accountability (which is associated with improved HDI) and foster effective regulation. More focus is needed on the management of water-related consequences of rapid urbanization and industrialization, which are key drivers of increased water stress in the region. Water availability limitations should be considered in urban planning policies, while industrial development strategies should be complemented by stronger regulations on water use and controls on water pollution.

Furthermore, the principles of Integrated Water Resource Management (IWRM) should be applied to mitigate urban expansion, intensification of agriculture and industrialization as they worsen water stress. The use of water-saving technologies in agriculture and industry should be encouraged through positive incentives, regulations, transfer of technology, and partnerships between the public and private sectors. Improved governance at the watershed and basin levels will help to mitigate the impact of upstream users, on both midstream and downstream users and will lower the potential for conflict and environmental degradation.

A key concept in incorporating environmental governance in the planning of both national and sub-national development is of great importance. Environmental sustainability is to be regarded not as a peripheral concern, but rather central within human development frameworks. This entails the integration of development and environmental sustainability as well as the integration of governance quality into national frameworks of monitoring and evaluation.

The findings from this paper also highlight the need for adaptive and bottom-up governance approaches. While some contexts benefit from centralized policies, the Sub-Saharan African region is diverse and resource-constrained, needing more agile and inclusive frameworks. Community-based water management systems can be instrumental, and therefore, legal and institutional support will be needed. In addition, local and traditional governance systems can be integrated to make formal governance systems more applicable and legitimate to the community.

In addition to the findings that highlight national and regional policy responses, there needs to be more transboundary and global policy initiatives. Unilateral policy efforts will not work in Sub-Saharan Africa, given the region's numerous transboundary freshwater resources. More needs to be done to optimize the governance, regulation, and developed tributaries of cross-border infrastructure and monitoring systems, and to develop international partnerships through River Basin Organizations, the African Union, and

global development institutions. These partnerships will facilitate the effective management of transboundary water stress challenges.

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APPENDIX

Appendix 1: Selected SSA Countries

Angola	Gambia	Nigeria
Burundi	Kenya	Senegal
Benin	Lesotho	Sierra Leone
Cote d' Ivoire	Madagascar	Chad
Cameroon	Malawi	Togo
Congo Rep.	Mali	Uganda
Djibouti	Mozambique	Zambia
Ghana	Niger	Zimbabwe

PERFORMANCE GAPS IN URBAN SERVICED LAND ALLOCATION FOR MSEs: EVIDENCE FROM MUNICIPAL AND ZONAL LEVELS IN GEDEO ZONE, ETHIOPIA

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ABSTRACT

Access to urban serviced land is essential for the establishment and growth of micro and small enterprises (MSEs), yet gaps often exist between land allocation plans and actual implementation. This study examines performance gaps in urban serviced land allocation for MSEs using evidence from municipal and zonal levels in Gedeo Zone, Ethiopia. The analysis is based on secondary administrative data obtained from Dilla Municipality (2020/21–2024/25) and the Gedeo Zone Urban Development and Infrastructure Department (2015/16–2019/20). A descriptive and comparative approach was employed to assess discrepancies between planned targets and actual performance in serviced land allocation, land preparation, and land supply. The findings reveal persistent performance gaps at both governance levels. In Dilla Municipality, actual serviced land allocation for MSEs remained consistently below planned targets despite increasing plans over time. At the zonal level, both land preparation and land supply for MSEs achieved only a small share of planned targets, with particularly severe bottlenecks in the transfer of prepared land to final users. These results highlight systemic implementation challenges and underscore the need to strengthen coordination, implementation capacity, and monitoring mechanisms to improve access to serviced land for MSEs and support inclusive urban development.

Keywords: urban serviced land, Micro and Small Enterprises (MSEs), land allocation performance, municipal–zonal coordination

JEL code: R14

INTRODUCTION

Micro and Small Enterprises (MSEs) play a central role in employment creation, income generation, and poverty reduction in developing economies, particularly in Sub-Saharan Africa. In Ethiopia, microenterprises alone account for the overwhelming majority of manufacturing employment, underscoring their importance in achieving inclusive economic growth and sustainable development goals (Endris & Kassegn, 2022; Weldelessie, 2019). National surveys and policy documents consistently emphasize the strategic contribution of MSEs to urban livelihoods, industrial development, and structural transformation (MoUDH, 2016;

Gebrehinot & Wolday, 2006). However, despite their recognized role, the growth and continuity of MSEs remain constrained by multiple structural and institutional challenges, limiting their ability to contribute fully to urban economic development.

Among the various constraints facing MSEs, access to serviced land and adequate working premises has been repeatedly identified as one of the most critical barriers to enterprise start-up, survival, and growth. Empirical studies across Ethiopian cities show that a substantial proportion of MSEs operators lack their own premises and face high rental costs, insecure tenure, and poorly located workspaces (*Dereje et al.*, 2019; *MoUDC*, 2013; *Tadesse*, 2020). Similar findings are reported in regional and international contexts, where location and access to appropriate premises strongly influence enterprise performance and productivity (*McPherson*, 1996; *Sefiani et al.*, 2016). Insufficient access to serviced land not only raises operating costs but also discourages fixed asset investment and increases business instability, particularly for enterprises with limited capital (*Abdu & Marisennayya*, 2026; *Singh & Singh*, 2023).

Beyond physical scarcity, the literature highlights governance-related challenges in urban land allocation systems. Bureaucratic procedures, lack of transparency, and weak institutional coordination frequently undermine the equitable and efficient distribution of land for productive uses, including MSEs development (*Muranda et al.*, 2014; *Woldemariam*, 2021). Furthermore, broader local economic development constraints, such as poor infrastructure, weak urban-rural connectivity, and restricted access to services, can further reduce employment opportunities and the effective usage of land resources (*Ritter*, 2014). Studies document cases where land and working premises intended for MSEs are subject to rent-seeking behavior, third-party transfers, and political or social bias, disadvantaging intended beneficiaries such as youth and women (*Dereje et al.*, 2019; *Muranda et al.*, 2014). Weak implementation of existing policies and regulations further exacerbates these challenges, creating a persistent gap between stated policy objectives and actual outcomes on the ground (*Gebrehinot & Wolday*, 2006; *MoUDH*, 2016).

Urban land allocation inefficiencies also have broader spatial and economic implications. Evidence from Ethiopian cities indicates that land consumption often outpaces population growth, with substantial inefficiencies in the allocation of industrial and commercial land uses (*Koroso et al.*, 2021). Such inefficiencies contribute to urban sprawl, underutilized serviced land, and missed opportunities for employment-intensive activities such as MSEs. Spatial studies further demonstrate that planned land use patterns, residential expansion, and large-scale developments can unintentionally crowd out small businesses by reducing access to suitable locations and increasing competition for serviced land (*Fanta & Megento*, 2020; *Widita & Lechner*, 2024). These dynamics underscore the importance of aligning urban land planning with the locational and operational needs of MSEs.

Ethiopia's national development frameworks, including the Micro and Small Enterprise Development Policy and Strategy, Growth and Transformation Plan II, and the Ten-Year Development Plan, explicitly recognize the need to provide serviced land, production clusters, and market facilities for MSEs (*MoUDH*, 2016; *NPC*, 2016). These policies emphasize coordinated implementation, institutional capacity building, and anti-rent-seeking measures to improve urban land governance.

Such spatial strategies often rely on identifying local resource clusters to drive regional growth (Horváthné Kovács *et al.*, 2022). Nevertheless, empirical evidence suggests that implementation capacity at municipal and local government levels remains weak, resulting in significant discrepancies between planned targets and actual land delivery for MSEs (Gebrehivot & Wolday, 2006; Woldemariam, 2021). The persistence of these gaps highlights the need for performance-based assessments that go beyond policy intent to examine actual outcomes.

While existing studies highlight the importance of land access for micro and small enterprises (MSEs), the literature remains fragmented between enterprise-level constraints and broader urban land-use dynamics, with limited attention to how land allocation systems perform in practice (Duranton & Puga, 2020; Fox & Sobnesen, 2012). In particular, there is a lack of empirical evidence on the performance gap between planned and actual serviced land allocation for MSEs across governance levels. Moreover, planning-implementation discrepancies, weak institutional performance, and limited public participation further constrain effective land delivery (Watson, 2009; Rosmala *et al.*, 2023; Jakar *et al.*, 2021), especially in rapidly urbanizing and secondary city contexts (Angel *et al.*, 2011; UN-Habitat, 2020). Consequently, how municipal-level land allocation outcomes align with zonal-level targets and the actual spatial needs of MSEs remains insufficiently understood.

Hence, the objective of the study was to examine the performance of service land allocation micro and small enterprises (MSEs) at municipal and zonal level in Gedeo Zone. The specific objectives of the study were to analyze trend and performance gaps between planned and actual serviced land allocation for MSEs in Dilla Municipality, to assess land preparation and land supply performance for other multiple land use categories, and to draw implementation for improving service land allocation mechanisms to support MSEs growth and urban development.

MATERIALS AND METHOD

Study Area: The study was conducted in Dilla Municipality which is administrative and economic for Gedeo Zone recently reclassified as a Regiopolis, a designation used by Bureau of South Ethiopia Urban and Infrastructure Development for a select group of primary cities that serve as significant regional hubs. Accordingly, Regiopolis city is a city that serves as a regional or development center, next to the capital city, Addis Ababa. Regiopolis is a city that is less defined by its local economic, social, and cultural impact than a metropolitan city. Driven by coffee production and its strategic location, Dilla Regiopolis functions as a major market and commercial hub on the main transport corridor linking Addis Ababa, Ethiopia, and Nairobi, Kenya. In addition, the Regiopolis provides various urban function such critical commercial, social, and transportation functions for the surrounding regions. The fast-growing population of the Regiopolis together various economic activities make a suitable place for doing business. Dilla Municipality is the administrative centre of Gedeo Zone and one of the major urban centres in the region. The municipality plays a key role in the allocation of serviced urban land for various uses, including micro and small enterprises (MSEs) production and market activities. Gedeo Zone Urban

and Infrastructure Development Department comprises multiple municipalities, with zonal authorities responsible for coordinating urban development, land preparation, and land supply across these urban centres. Examining both municipal and zonal levels allow for a multi-level assessment of serviced land allocation performance within the same administrative and spatial context.

Data Sources: The study relied solely on secondary administrative data obtained from official government sources. Municipal-level data on serviced land allocation for MSEs were collected from *Dilla Municipality* (2025), covering a five-year period from 2020/21 to 2024/25. These data include annual planned targets and actual performance in terms of serviced land allocated to MSEs. Zonal-level data were obtained from the *Gedeo Zone Urban Development and Infrastructure Department* (2025), covering the period 2015/16 to 2019/20. The zonal dataset includes planned and actual figures for land preparation and land supply (transfer to final users) across multiple land-use categories, including MSE production and market uses. Zonal data represent aggregated performance across all municipalities within the zone, including Dilla Municipality.

The use of secondary data is appropriate given the study's focus on assessing discrepancies between planned and actual serviced land allocation, which are formally recorded in official planning and implementation documents. Administrative data enable consistent comparison across multiple years and governance levels. However, such data may not capture informal land access practices or enterprise-level experiences, such as operating from residential premises or renting workspaces. Differences in reporting periods between municipal and zonal datasets may also limit direct comparability. These limitations were addressed by emphasizing performance ratios and trends within an institutional performance assessment framework.

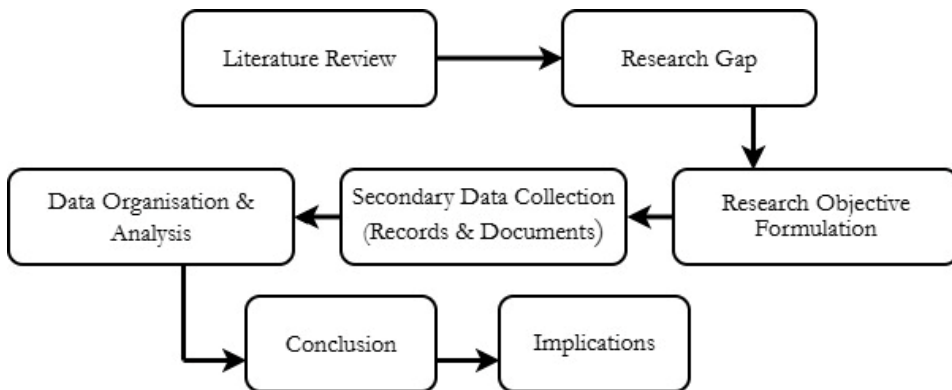
Definition: According to the *South African Housing & Infrastructure Fund* (2020), serviced land is essentially land that is prepared or developed with all necessary utility connections and is ready for immediate use (*SAHIF*, 2020, *Urban Lands Lease Holding Proclamation*, 2011).

Units of Analysis and Variables: The primary unit of analysis is serviced urban land allocated for micro and small enterprises. At the municipal level, land allocation is measured in square meters (m²), while at the zonal level, land preparation and land supply are measured in hectares (ha). To ensure analytical consistency, the study focuses on performance ratios and percentages rather than absolute quantities. The key variables analyzed include planned serviced land allocation or preparation, actual serviced land allocation or supply, and performance ratio (actual performance as a percentage of planned targets).

Data Analysis: The study employed a descriptive and comparative analytical approach. First, a trend analysis was conducted to examine changes in planned and actual serviced land allocation for MSEs in Dilla Municipality over the study period. Second, a performance gap analysis was undertaken by comparing planned targets with actual performance at both municipal and zonal levels. At the zonal level, land preparation and land supply performance for MSEs were analyzed alongside other land-use categories to contextualize MSEs allocation within broader urban land management practices. Finally, municipal-level findings were compared with zonal

aggregates to identify institutional and implementation gaps between planning and execution across governance levels. Results are presented using tables and percentages to clearly illustrate discrepancies between plans and outcomes. Furthermore, the diagram (*Figure 1*) below briefly illustrates the Material and Method section of the study.

Figure 1: Study Design



RESULTS AND DISCUSSION

Performance of Urban Serviced Land Allocation for MSEs in Dilla Municipality

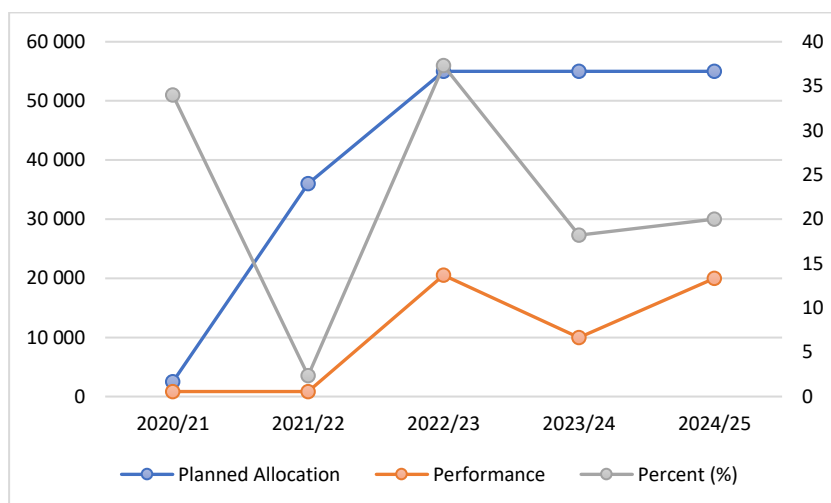
Figure 2 presents trends in planned and actual serviced land allocation for micro and small enterprises (MSEs) in Dilla Municipality over the period 2020/21–2024/25. The results reveal substantial discrepancies between planned targets and actual performance throughout the study period. Although planned serviced land allocation increased markedly over time, actual allocation remained consistently below targets, resulting in wide performance gaps.

In 2020/21, only 34% of the planned serviced land for MSEs was allocated. Performance declined sharply in 2021/22, when actual allocation accounted for merely 2.36% of the planned target, despite a significant increase in planned land. This sharp decline, as reports highlights, reflect implementation capacity limitations, broader institutional disruption due to unstable municipal leader recurrent turnover, Dilla Regiopolis local government unmatched commitment to finance, support, and follow-up the plan execution related to land servicing and transfer of the target users. Although some improvement was observed in 2022/23, with performance reaching 37.31%, subsequent years again recorded low achievement levels of 18.18% and 20.00%, respectively. These findings indicate that increases in planned targets did not translate into proportional improvements in actual serviced land delivery.

The observed pattern suggests persistent implementation challenges in municipal land management. Similar discrepancies between planning and execution have been

documented in other Ethiopian cities, where ambitious urban land allocation plans are undermined by limited institutional capacity, administrative inefficiencies, and infrastructure-related constraints. A recent perception study in Addis Ababa indicates a significant gap between urban land policy objectives and their implementation on the ground (*Aytenew et al., 2025*). Empirical evidence from major Ethiopian cities shows that weaknesses in urban land administration, procedural delays, and gaps between policy intentions and operational practices continue to constrain effective land delivery for productive uses, including micro and small enterprises (*MoUDC, 2013; Aytenew et al., 2025*). For MSEs, such inconsistencies constrain access to secure and serviced working premises, limiting enterprise expansion and productivity.

Figure 2: Summary of Gap for Serviced Land Allocation (m²) for MSEs in Dilla Municipality



Source: Based on data from *Dilla Municipality (2025)*.

Zonal-Level Performance of Serviced Land Preparation and Supply in Gedeo Zone

Table 1 summarizes land preparation and land supply performance across major land-use categories in Gedeo Zone for the period 2015/16–2019/20. At the zonal level, overall land preparation achieved 30.66% of planned targets, while land supply or transfer to final users reached only 5.30%, indicating a significant bottleneck between preparation and actual allocation.

With specific regard to MSEs production and market uses, land preparation performance stood at 12.41%, while land supply to final users was limited to 5.92% of the planned target. Compared with other land-use categories, MSE-related land uses consistently exhibited lower performance, particularly in land supply. This pattern highlights the vulnerability of MSEs within the urban land allocation system, where priority may be given to other land uses such as industrial development or institutional purposes.

Table 1: Land Preparation and Supply Performance for Various Uses in Gedeo Zone, 2015/16-2019/20.

Various Land Uses	Land Preparation (ha)			Land Supply or transfer to final users (ha)		
	Plan	Performance	Percent	Plan	Performance	Percent
Cooperative Residential	379.5	52.9	13.94	350	9.7	2.77
Residential Private	253	59.4	23.48	233	13.8	5.92
Commercial and Investment	428	63.4	14.81	394.1	23.3	5.91
MSEs production and market	303.8	37.7	12.41	310.9	18.4	5.92
Government and NGO institutions	372	195.6	52.58	342.5	12.7	3.71
Service Sectors institutions	580	173.4	29.90	533.2	31.6	5.93
Industrial Development	821.8	379.6	46.19	840.65	49.76	5.92
Total	3138.1	962	30.66	3004.35	159.26	5.30

Source: Based on data from *Gedeo Zone Urban Development and Infrastructure Department* (2025)

The sharp decline from land preparation to land supply suggests that challenges extend beyond physical land development to administrative and procedural processes involved in transferring land to end users. Such inefficiencies reduce the effectiveness of land policies aimed at supporting enterprise development and contribute to unmet demand for serviced land among MSEs operators.

Municipal-Zonal Performance Gaps and Governance Implications

Comparing municipal-level evidence from Dilla Municipality with zonal-level performance in Gedeo Zone reveals a consistent pattern of performance gaps across governance levels. While Dilla Municipality exhibited highly variable and often low achievement rates in serviced land allocation for MSEs, zonal data show that similar gaps exist in land preparation and supply across the zone as a whole. This indicates that municipal underperformance is not an isolated phenomenon but rather reflects broader zonal-level institutional and implementation constraints.

The findings suggest that weaknesses in coordination between municipal and zonal authorities, limited implementation capacity, and procedural inefficiencies collectively undermine the effective delivery of serviced land for MSEs. Even where land preparation targets are partially met, the failure to translate prepared land into actual allocation constrains enterprise development. These results reinforce the argument that improving access to serviced land for MSEs requires not only

improved planning but also stronger implementation mechanisms and accountability across governance levels.

Furthermore, while this study provides empirical evidence on performance gaps in serviced land allocation for MSEs using secondary administrative data, it is limited in its ability to directly explain the underlying causal mechanisms. To address this, the findings are interpreted considering existing literature on urban land governance and institutional performance. Previous studies have shown that constraints such as limited implementation capacity, weak institutional coordination, and inadequate political commitment can significantly affect land delivery outcomes (*Watson, 2009*). In addition, context-specific evidence from Dilla Municipality indicates that factors such as high compensation costs associated with coffee-based agroforestry systems, limited land preparation capacity, and insufficient attention to municipal land development functions further constrain the effective supply of serviced land (*Gedecho & Horváthné Kovács, 2024*). These challenges are likely to contribute to the observed discrepancies between planned and actual land allocation performance. However, such explanations should be interpreted with caution, as they are not directly derived from the dataset used in this study. Future research could build on these findings by incorporating qualitative methods, such as interviews with municipal officials and MSEs operators, to provide deeper insights into the institutional and procedural drivers of land allocation performance.

Implications for Urban Development and MSEs Growth

The persistent performance gaps identified in both municipal and zonal analyses have important implications for urban economic development. MSEs rely heavily on access to affordable, well-located, and serviced land for production and market activities. Inadequate land allocation limits their capacity to formalize, expand, and generate employment, thereby weakening their contribution to inclusive urban growth.

Moreover, the mismatch between planned and actual serviced land allocation undermines the credibility of urban land use plans and reduces the effectiveness of policy interventions targeting MSEs development. Addressing these challenges requires improved coordination between planning and implementation, prioritization of MSEs land needs within urban development strategies, and strengthened monitoring of land allocation performance.

CONCLUSIONS

This study examined performance gaps in urban serviced land allocation for micro and small enterprises (MSEs) using evidence from Dilla Municipality and the broader Gedeo Zone in Ethiopia. By comparing planned targets with actual performance at municipal and zonal levels, the study identified persistent discrepancies between land allocation plans and their implementation. The findings show that, despite increasing planned targets, actual delivery of serviced land for MSEs remained consistently below expectations, particularly at the municipal level. Zonal-level analysis further revealed substantial bottlenecks between land preparation and land supply to final users, indicating systemic implementation challenges across governance levels.

The results suggest that municipal-level underperformance in serviced land allocation for MSEs is embedded within broader zonal institutional and procedural constraints. Even where land preparation targets were partially achieved, inefficiencies in land transfer and allocation processes significantly limited access to serviced land for MSEs. These performance gaps constrain enterprise establishment and growth, thereby weakening the potential contribution of MSEs to employment creation and sustainable urban development.

Addressing these challenges requires moving beyond ambitious planning targets toward strengthening implementation capacity and coordination between municipal and zonal authorities. Policy efforts should prioritize serviced land provision for MSEs production and market activities, improve monitoring of planned versus actual performance, and streamline administrative procedures related to land transfer and allocation. Enhancing transparency and accountability in urban land management systems is also essential to ensure that serviced land reaches intended beneficiaries. To address the persistent challenges of serviced land supply for Micro and Small Enterprises (MSEs), the following strategic directions are proposed to facilitate effective implementation. Realizing MSEs growth requires a coordinated effort from all stakeholders, necessitating harmonized policies that provide immediate solutions to structural bottlenecks. The critical performance gaps in serviced land allocation can be mitigated through the following targeted institutional measures:

- *Decentralized Administration:* Changing from a centralized municipal model of serviced land allocation Dilla Municipality to a decentralized "One-Stop-Shop" system at the sub-city or local level. This streamlines land transfer and permitting processes, reducing bureaucratic delays.
- *Dedicated Land Banking:* Establishing a specific land inventory ("land bank") reserved exclusively for MSEs development to prevent competition with large-scale developers.
- *Performance-Oriented Monitoring:* Implementing a rigorous "Planned vs. Actual" tracking system to enhance accountability and ensure that land (working space, shade, production clusters) reaches the intended beneficiaries, MSEs.

Achieving these goals requires the integrated coordination of the following key stakeholders:

- *Regional and Zonal Level:* South Ethiopia Regional Bureaus (Urban & Infrastructure Development; Job Creation & Enterprise Development) together with similar zonal counter parts to supervise proper implementation of their respective policy frameworks.
- *Local Government:* Dilla Regiopolis Local Government and Municipality management to oversee site preparation and utility connectivity.
- *Legislative Oversight:* Zonal and Dilla Regiopolis Councils to ensure adequate budget allocation and conduct regular impact evaluations.
- *Sectoral Departments:* Zonal and Regiopolis-level departments focused on Job Creation and Enterprise Development to verify beneficiary eligibility.

While the study relied on secondary administrative data, which may not capture informal land access mechanisms, it provides important empirical insights into multi-

level performance gaps in urban serviced land allocation. Future research could complement these findings with enterprise-level surveys and comparative studies across additional municipalities to further inform land policy and urban development strategies.

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AIR-RAIL TRANSPORT LINK DEVELOPMENT OPPORTUNITIES IN HUNGARY WITH A SPECIAL FOCUS ON RURAL AREAS

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ABSTRACT

This research studies the connection between air and rail transport and its development opportunities in Hungary, considering how it could contribute to the improvement of transport in regions that are further from major airports. During the research, we found that although organizing connections between air and rail services presented several challenges, it was still worth exploiting the potential it held. Successful international examples proved that the model was viable and found its place in the market. In Hungary, transportation options could be expanded without billions of dollars in investment by integrating existing networks and still bringing air travel closer to rural residents. It was also concluded that there was a clear demand from travelers for an organized service that enabled the combination of rail and air travel (hereinafter referred to as 'combined ticket'). The significant presence of air passengers in rail transport (as an alternative to road transport) could help improve the cost-effectiveness of rail transport and contribute to the rise in service quality. Last but not least, the environmental impact should not be overlooked: those who choose the train instead of road transport leave a significantly smaller ecological footprint during their journey, simply by just taking a train which runs anyway, instead of using an individual vehicle.

Keywords: intermodal transport, sustainability, regional airport, flight and train integration, passenger survey

JEL code: R41, O18

INTRODUCTION

The research has aimed to determine how closely rail transport can be connected to air travel, and whether it can be an effective and suitable tool for making international flights accessible in regions further from major airports. Our analysis covers the currently available services, international examples, and thoroughly examines the development opportunities within Hungary. The research focuses exclusively on civilian commercial transport and does not extend to private or military operations and infrastructure.

Air travel is not equally accessible to everyone. Although the emergence of low-cost (commonly referred to as 'budget') airlines has made prices more affordable, less

than 20% of the global population has flown at least once in their lifetime (Gössling & Humpe, 2020). Additionally, air travel is generally not a daily mode of transportation; compared to other forms of public transport, it is physically less accessible. The nearest airport is typically farther from people's residence than the most easily reachable bus stop or train station.

The present situation of air and rail transport in Hungary

Hungary's geographical location is advantageous from the perspective of international air transport as well: being in the central part of Europe, it is not too far from either the East or the West, offering numerous routes. Domestic air traffic continues to grow steadily. In 2024, a new record was set, with a total of 1,143,937 aircraft passing through Hungary's airspace, requiring air navigation services. This represents an average of more than 95,000 aircraft per month. This value shows a 5.99% increase compared to 2023, which was also a record year, and a 21.08% rise compared to pre-COVID traffic levels in 2019. During the peak period of 2024, in July and August, more than 120,000 aircraft were handled by Hungary's air traffic services provider, HungaroControl Zrt. (HUNGAROCONTROL, 2025). Traffic is expected to continue growing in 2025. Even in the first days of the year, the number of flights increased by an average of 15% compared to the same period in 2024 (EUROCONTROL, 2025). The majority of Hungary's commercial air traffic takes place at Budapest Ferenc Liszt International Airport. In 2024, the airport welcomed 17.6 million passengers, which was 19.5% higher than the previous year's traffic, and even surpassed the pre-COVID 2019 figures by 8.7% (Budapest Airport, 2025). The growth rate is remarkable even within the European Union, where passenger traffic increased by an average of 7.3% in 2024 (Davitt, 2025).

The structure of traffic was significantly altered by the bankruptcy of Hungary's national airline, MALÉV, in 2012. The 66-year-old national carrier had handled a large proportion of transfer traffic in Budapest, providing excellent connections between East and West. It used Budapest Ferenc Liszt International Airport as a hub, meaning that many passengers whose final destination was not Hungary also passed through the airport. This made operating routes, particularly in the Balkans and the Middle East, economically viable. Budapest functioned as a 'hub & spoke' air distribution center. The airline went bankrupt in 2012, which shocked the industry, including Budapest Airport. Of the 8.9 million passengers from the previous year, 3.2 million were flown by Malév, with 1.3 million transfer passengers (MTI, 2012). The situation regarding passenger traffic has since completely transformed. In the absence of a national airline, transfer traffic has significantly decreased, at least in terms of transfers organized by airlines.

The traffic at regional airports is negligible compared to Budapest. Domestic commercial flights have ceased, although there was a time when they operated daily (Domonkos, 2024). As a result, their commercial traffic is almost entirely limited to international flights. Among these airports, Debrecen International Airport stands out, with traffic exceeding 600,000 passengers in 2019, before the COVID pandemic. However, after the pandemic, traffic declined significantly, and the 300,000 passengers in 2023 marked a 23% increase compared to the previous year (Dehir,

2023). Notable commercial passenger traffic is also recorded at Győr-Pér, Pécs-Pogány, and Hévíz-Balaton airports in Hungary.

The challenges faced by Hungarian rail transport are deeply rooted and date back to the post-World War II period. The system has always lagged behind modern technologies and societal expectations. The trains have always been slow and outdated, and the level of service has not met the expectations of travelers (*Momentum Mozgalom*, 2023). High-speed rail systems, which have dynamically developed in many parts of the world, have not yet appeared in Hungary. However, in recent years the government has devoted significant energy to identifying problems and has developed a strategy for improving the organization and infrastructure (*Nemzeti Fejlesztési Minisztérium*, 2014). One of the most spectacular elements of the development is the integration of the national railway company (MÁV) and the bus operating company (Volán) (*Magyarbusz.info*, 2024).

Expansion of the Air Transport Network through the Integration of Rail Transport

The air transport network is continuously expanding, a process that has been significantly accelerated by the emergence of low-cost airlines. In addition to the major airports of large cities, smaller towns and secondary airports of major cities have also appeared on the air transport map. Thanks to this development, competition has intensified between different transport sectors. Alongside the evolution of rail and air travel, road public transportation has also transformed. The dynamically developing highway systems and vehicles have made bus transport more efficient and attractive. The price competition between transport sectors has led to the emergence of bus companies operating in a similar model to low-cost airlines, offering affordable fares (*NEA Transport Research and training*, 2006).

Combined ticket concept

Travel can be combined so that one segment is completed by rail and the other by air. The safety of these connections is enhanced by the fact that in Europe, railways generally operate with higher frequency than air services. For this reason, this travel mode can be especially advantageous for those who are less experienced in organizing transfers.

In Case of Delays, Passengers Are Taken Care Of

Like the case of transfers between two air flights, when a ticket is purchased for the entire route, the operator of the flights is responsible for ensuring the passenger's successful transfer, or more specifically, for guaranteeing the possibility of a transfer. If the transfer is missed due to the airline's fault (e.g., due to a delay in the first segment), the airline is obligated to take care of the passenger and provide an alternative solution at its own expense (EU, 2004). This does not apply to cases where the passenger chooses two separate flights and organizes the connection themselves. In such cases, the passenger bears the associated risks. With a 'Rail & fly' combined ticket, the airline is also responsible for the passenger in similar situations (*Lufthansa*, 2025).

Environmental and Economic Benefits

At the national economic level, the environmental impact of various modes of transport and their pollution are important considerations. When comparing the development of rail and air transport, it must be considered that most railway tracks are already in place, and the rolling stock is also readily available. Therefore, investment costs here are limited to maintaining, developing, and modernizing the existing infrastructure. In contrast, domestic regional airports would require significant investment to handle regular air traffic. The development of airports is highly expensive, as is the operation of security and precision systems. For example, Budapest Airport spent over 130 billion HUF between 2019 and 2024 (*Budapest Airport*, 2024), and even greater investments are planned for the coming years. Additionally, the operational costs of flights represent a further expense.

Successful solutions in Europe

Countries with advanced transportation systems already have a long tradition of combining different modes of transport in an organized manner. In many countries, this service already includes air travel. These combined tickets are typically available for purchase on the airline's website. For example, in Spain, the national airline Iberia offers a product called 'Train & Fly' (*Iberia*, 2023). In France, the service is also available through the national airline Air France (*Air France*, 2025). The key feature here is that the passenger does not organize the connection themselves. The transfer process is very similar to transferring to another flight. When purchasing tickets, the system takes into account the necessary time for the transfer. If the passenger misses the connection due to the airline's fault (e.g., due to a flight delay), Air France takes responsibility and rebooks the passenger for the next train. This is perhaps the greatest advantage over self-organized connections, as it is difficult to assert one's rights if the passenger misses the connecting travel due to no fault of their own. Additionally, with such combined tickets, passengers can accumulate points for loyalty programs (typically frequent flyer miles) for both the air and rail travel.

In Germany, the national airline also offers the option of combining rail and air transport. Lufthansa Express Rail provides connections from 28 railway hubs across the country to Frankfurt, the airline's largest distribution centre (*Wandelt & Sun*, 2022). The main advantage of the service is the same as that offered by other similar companies: a guarantee for the transfer. Lufthansa also offers additional benefits, such as access to the railway company's (DB) business lounge for frequent flyers, or automatic seat reservations for the rail segment (*Lufthansa*, 2025; *Rudolph et al.*, 2023). There are already several examples of similar solutions in Europe, such as AiRail in Austria (*ÖBB*, 2024) or AccesRail and FlexFlight in Italy, the latter of which provides connections to Germany (*ITA Airways*, 2025).

Hungary has a relatively extensive railway network of over 7,000 km (*KSH*, 2020), with an active service system that could be integrated into the air transport system, similar to other European countries. The numerous railway stations could serve as excellent connection points to the air transport network, allowing passengers to travel to many parts of the world with a single transfer at Budapest Liszt Ferenc Airport. However, a significant shortcoming is that the airport is only connected to rail

transport via the 1st terminal, which has not been used for public commercial passenger traffic for years. The plan to connect the railway system with the 2A and 2B terminals, which handle nearly all the traffic, has been under discussion for years, but so far none of the many concepts have been implemented. As a result, passengers can only reach the 2A and 2B terminals by road. Passengers arriving by train at Terminal 1 can take the BKK bus service, taxi, or arrange transfers in other ways. The bus service is used by nearly 50,000 passengers per week, which accounts for about one-fifth to one-sixth of the airport's total passenger traffic (BKK, 2023). The airport does not provide its own shuttle bus service from the train station to the 2 terminals. Furthermore, at regional airports in Hungary, organized connections between airports and railways are even less developed, although there have been examples of similar bus services being organized in the past.

MATERIALS AND METHODS

In addition to reviewing the literature, we also collected primary data on travel habits through quantitative research. Our goal was to obtain the broadest possible sample from the entire population, without limiting it to any particular social class, location, or other criteria. The most suitable research method for data collection proved to be the questionnaire. It included both multiple-choice and Likert scale questions. We avoided open-ended questions in order to ensure maximum objectivity. For the Likert scale questions, we deliberately provided an even number (four) of answer options, to avoid some respondents choosing the middle (neutral) value simply for convenience. Filling out the questionnaire took no more than a few minutes.

We also reminded the participants to focus exclusively on commercial flights in the questionnaire and to exclude sport or hobby flights, as well as military operations. The number of flights referred to round-trip journeys, meaning a Budapest-Faro round trip counted as a single flight, not two. The sample of the research was not representative. The online questionnaire was created on a cloud-based platform, and the survey link was shared on social media between January 12th and April 30th, 2025. On Facebook, the survey was not filtered to any specific group; anyone could answer the questions and share the link.

The raw data collected from the responses were first cleaned and then processed using MS Excel. Every single data point was converted into a numerical value; thus, a complete code table was created. In addition to evaluating the answers to the questions individually, we also attempted to identify correlations between the feedback provided by different groups of respondents. The conclusions drawn from these correlations were analyzed separately and visualized using graphs. For the Likert scale questions, mean, mode, and standard deviation calculations were done. A Chi-square test was also made, and the relationship between two questions in the cross-tabulation analysis was examined too.

In addition to the questionnaire research, we conducted structured interviews with the managers of several regional airports, the manager of an airline, and an expert from MAV. We prepared a set of pre-defined questions in order to collect opinions primarily on the situation of the airport, its connection to the railway, and

its development potential. Since the conversation was conducted in person, it was also possible to collect data on the questions that arose during the interview.

RESULTS AND DISCUSSION

A total of 174 responses to the questionnaire were received. The overwhelming majority of respondents were middle-aged individuals with higher education degrees. Background variables were distributed among the respondents as presented on Figures 1-3.

Figure 1: Age of respondents

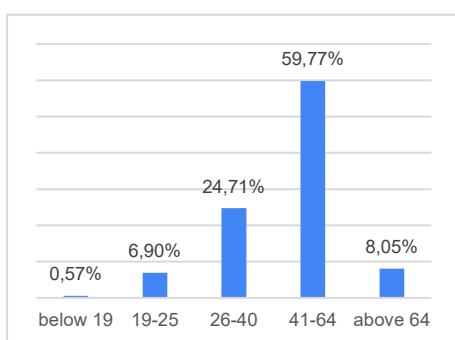


Figure 2: Education

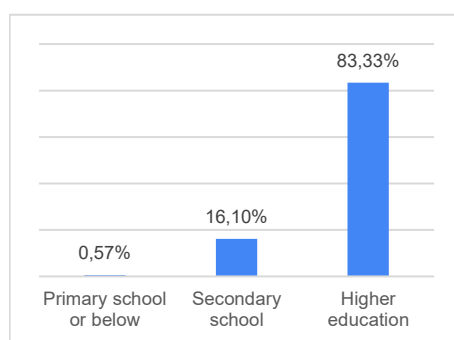
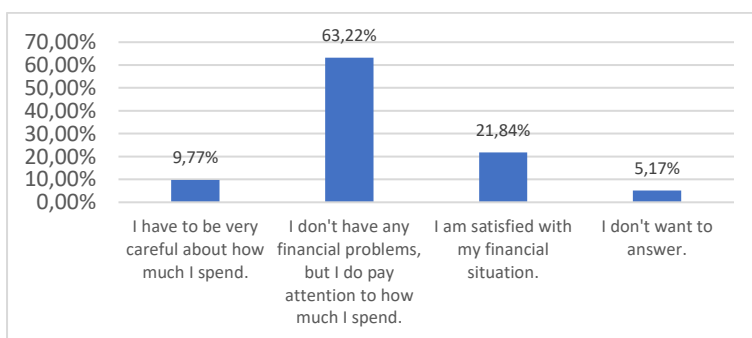


Figure 3: Annual income of respondents



In the question 'How often do you travel by plane in a year?', all five possible answers were selected by several respondents, which confirms that a heterogeneous group was successfully targeted in terms of travel habits (Figure 4). One of the options was 'more than 12 times,' which was specifically intended for those who travel more than once a month on average. 1.7% of respondents chose this option, and when adding those who travel 7-12 times per year, it becomes clear that more than 6% of respondents fly somewhere at least every two months.

A surprising result came from the question about how respondents get to the airport. Slightly more than half of frequent travelers (at least 3 times a year) travel to

the airport by private means (Figure 5), while 79% of all respondents do the same (Figure 6).

Figure 4: Yearly frequency of travelling by plane

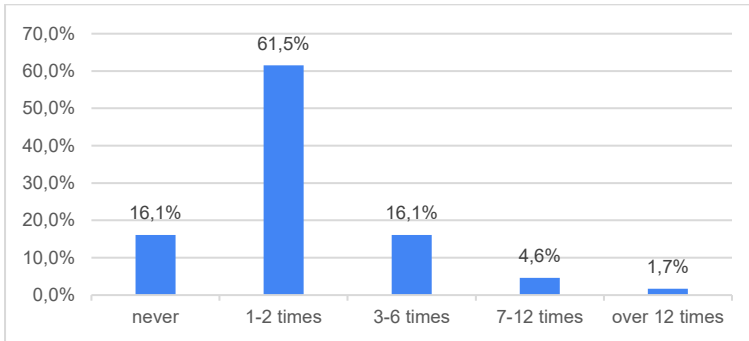


Figure 5: Airport access habits of those who travel at least three times a year

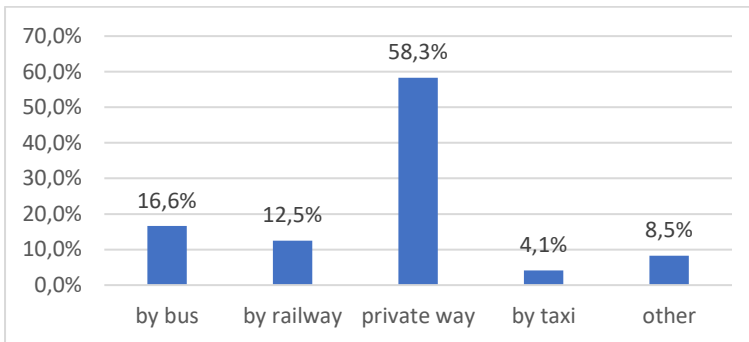
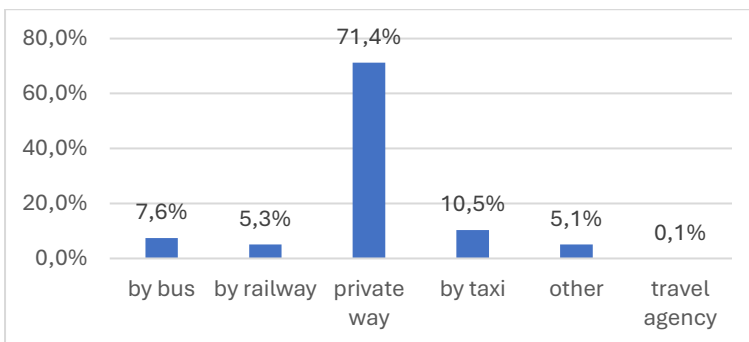


Figure 6: Airport access habits of survey participants

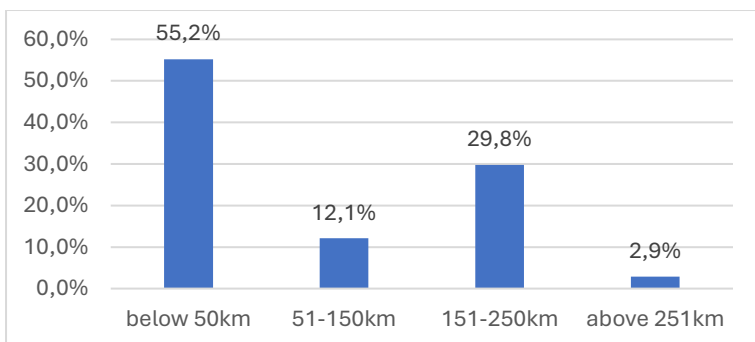


This means that they approach the airport either in their own car or with the help of someone they know, avoiding public transportation options. The decision is likely

influenced by convenience, as frequent travelers are aware of the high costs of airport parking and taxis.

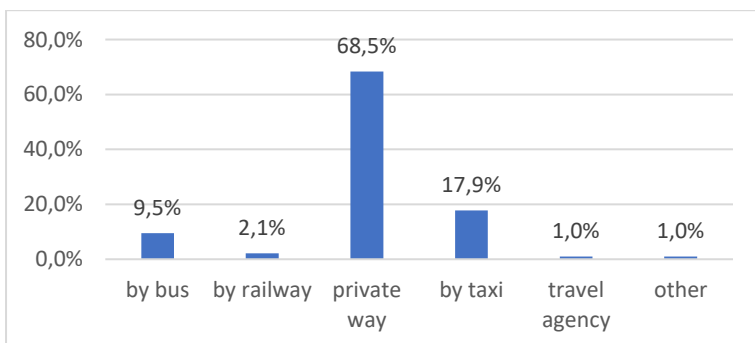
In terms of the distance to the airport, we were able to address multiple target groups (Figure 7).

Figure 7: Distance to the airport from the respondent's place of residence



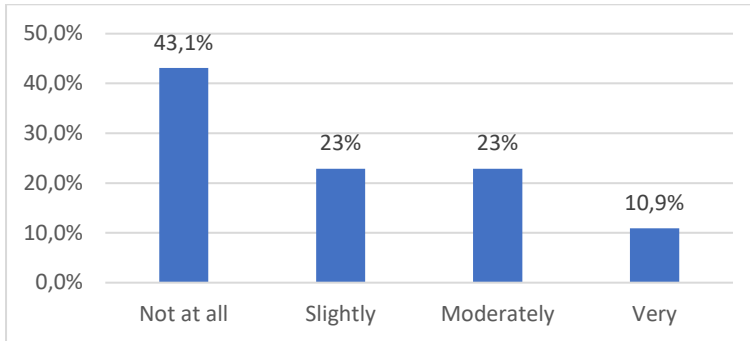
For most respondents, the airport they typically use is relatively close, within 50 km. Of these, only one respondent chose rail transport, and none of those living 50-150 km away chose this option (Figure 8). This is likely because airports do not have direct rail connections and are only accessible by bus or other road transportation. It is noteworthy that despite the relatively short distance, almost 70% of respondents avoid public transportation to the airport even when the round-trip distance is 100 km, which cannot be considered 'neighboring.' Factors such as the extreme arrival and departure times of many flights (early morning or late at night) may also play a role in this avoidance.

Figure 8: Airport access habits of those traveling within 50km



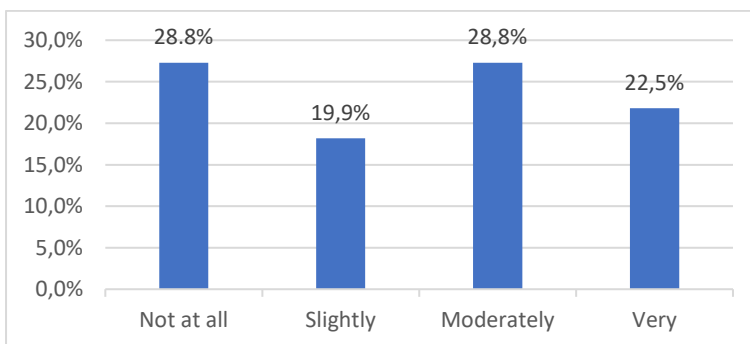
The results of the research have revealed that the distance to the airport is not a real obstacle to air travel. In response to the question 'I would travel more by plane if it were closer to my place of residence,' most respondents answered that it was 'not a determining factor' (Figure 9).

Figure 9: I would travel more by plane if it were more accessible nearby



86% of those traveling to the airport from a distance of 50-150 km traveled privately, as did 69% of those traveling from a distance of 150-250 km, and 80% from a distance of over 250 km also traveled by private means to the airport. However, all other respondents chose rail travel in every case. This fact supports the assumption that there would be significant demand for rail connections, provided it was of high quality, comfortable, and accessible. This is further reinforced by the fact that even regular rail travelers (those traveling 6-15 times per year or more) rarely (only 11%) choose rail transport to reach the airport. However, a surprisingly large number of them flew after reaching the airport by train. Over half (52%) of frequent rail travelers answered 'definitely' or 'more likely' to this statement. These are likely to involve airports abroad, typically transport hubs where intermodal transfer opportunities are well established. The proportion of such experiences among frequent rail travelers is detailed in *Figure 10*.

Figure 10: I have started my air travel with a train connection (Frequent rail travelers)



Among all respondents, however, this proportion was significantly different. Here, 'less likely' and 'not at all' dominated, together making up 74% (*Figure 11*).

One of the most important elements of the research is the following survey. The statement, to which respondents had to indicate the most appropriate answer, was:

'I would be happy to travel combining train and air travel if such a ticket were available.' Many respondents chose all four options, but slightly more would appreciate this opportunity and would take advantage of it (Figure 12).

Figure 11: I have started my air travel with a train connection (All respondents)

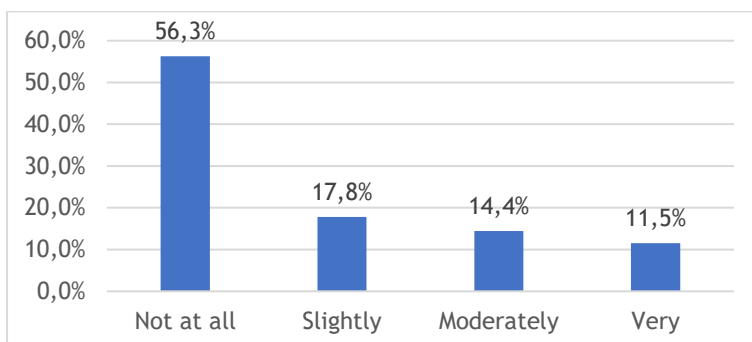
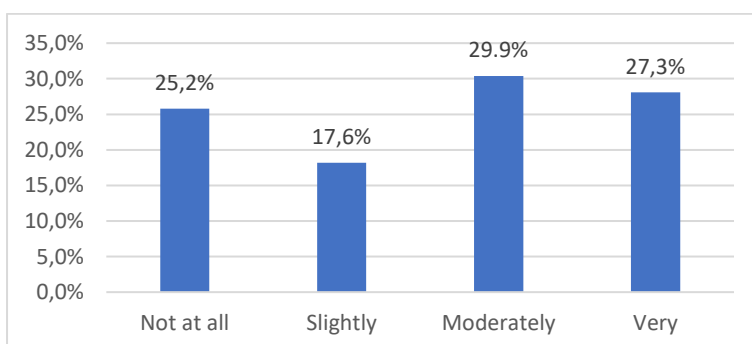


Figure 12: Responses to the question 'I would be happy to travel combining train and air travel if such a ticket were available'



Among those who have not yet traveled with a combined train-air ticket or who travel with it less frequently, more than half of the respondents would be open to this option: 27% would definitely use it, and 30% would probably use it (Figure 13). More than half of the 'never' respondents (52.2%) never travel by train.

These values indicate that there is demand for this service, but it needs to be communicated to the traveling public. An interesting result emerges when we examine the responses from those who fly at least three times a year (Figure 14). In this group, the proportion of those completely rejecting the option is slightly lower, and the number of fully open respondents is also smaller.

To the question, 'I would travel more by plane if it were available closer to my place of residence,' the majority of respondents answered "no": 43.1% answered 'no' completely, and 22.9% selected 'less likely' (Figure 15). This indicates that the

difficulty of access (time, cost, inconvenience, etc.) is generally not relevant to the frequency of air travel.

Figure 13: Openness to the service from those who have never traveled with a combined ticket

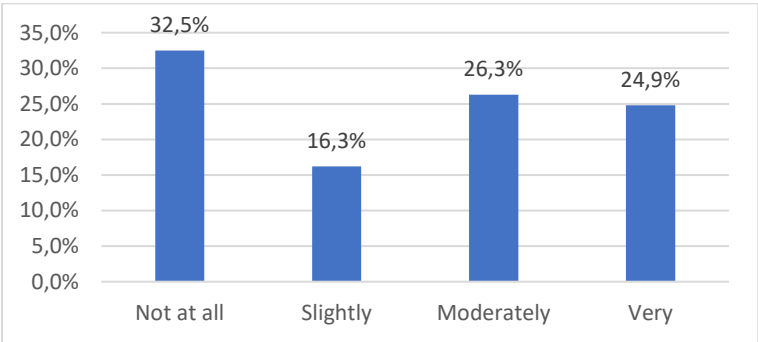


Figure 14: Openness to the combined ticket among those who fly at least three times a year

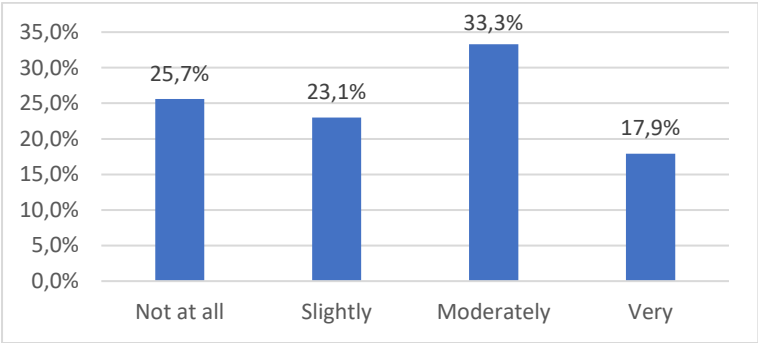
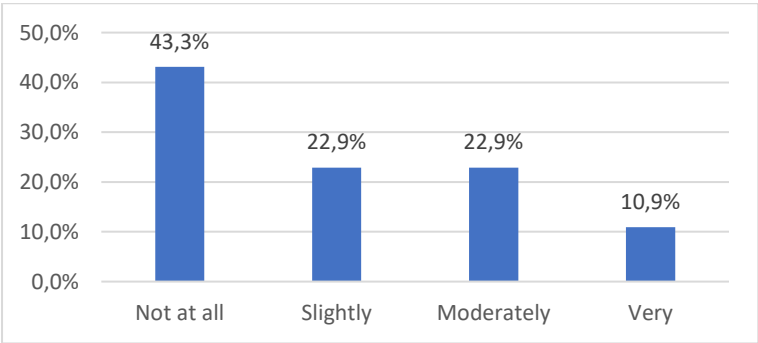


Figure 15: I would travel more by plane if it were more accessible nearby



The Likert scale questions analysis resulted in *Table 1*.

Table 1: Likert scale analysis results

Deviation	Ticket price	Safety	Distance from airport	Experienced Combi travellers	Interested in Combi services
Mean	2.80	1.74	2.02	1.81	2.61
Standard	1.04	0.86	1.05	1.06	1.15
Mode	4	1	1	1	3

As a result of the chi-square analysis, I have concluded that no strong relation can be identified between the different positions. When examining the strength of association between the questions "How do you get to the airport?" and "Above what distance would you rather choose flying?", I obtained only a 0.18 Cramer's V value. Regarding the latter question, the inquiry "Would you use the combined service if this option were available?" yielded the same value, while checking those who have never used the combined service, their usage resulted in only 0.24 if this option were available. Further analyses, for example examining airport access habits of those who travel at least three times a year, resulted in an even lower Cramer's V value (0.11).

Based on the interviews, we have come to the conclusion that regional airports see great potential in the combined ticket solution. The managers of Hévíz-Balaton, Pécs-pogány, Sármellék, and Debrecen Airports also reported that they were optimistic about traffic growth, to which - in addition to appropriate marketing and infrastructure development - the combined ticket could also contribute. MÁV's business development expert also considers the concept viable but sees a great challenge in technical implementation. The head of the Hungarian regional airline, Aeroexpress, would actively participate in the implementation.

CONCLUSIONS

As a result of the research, it has been determined that there is a clear demand for combined ticket services from the traveling public. Nearly two-thirds of respondents to the question said, „I would be happy to travel combining train and air travel if such a ticket were available’ and expressed interest in such a service. Many would also support the more intensive development of air travel, which could be supported by an increase in the number of passengers arriving by train. Similarly, the significant presence of air passengers in rail transport (instead of road transport) could improve the cost-effectiveness of rail transport, contributing to quality improvement. Last but not least, the environmental impact is also significant: those who choose trains over road transport leave a much smaller ecological footprint during their travel, simply by using public transportation rather than using an individual vehicle, a private car in most of the cases. With these factors in place, the combined ticket service could be successful for both organizers and users. However, developing a universal travel pass accepted by all transport modes would be a huge challenge. Coordinating the

different pricing models would be a monumental task and would likely meet with significant resistance from profit-driven companies. The feasibility of this idea could be the subject of a separate study. However, a good domestic example is the introduction of county and national passes, which ensure seamless access between road and rail transport with a single ticket.

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FIRM SURVIVAL IN AGRICULTURE: A SYSTEMATIC REVIEW OF ANALYTICAL APPROACHES

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ABSTRACT

The long-term viability of agricultural enterprises remains a key policy and research issue, particularly in sectors exposed to market and environmental uncertainties. This systematic literature review examines the application of survival analysis in studying the persistence and exit of agricultural firms. The review encompasses peer-reviewed studies published between 2014 and 2024, identified through structured searches in the Web of Science and ScienceDirect databases. Studies were included if they applied survival analysis or related quantitative methods and were published in journals ranked at least in the Q3 category according to SCImago. Thirteen publications met the inclusion criteria. Most studies employed Cox proportional hazards models or Kaplan–Meier estimators and analyzed a range of explanatory variables, including demographic, financial, organizational, and institutional factors. While the majority focused on general farm-level dynamics, only two addressed wine-producing enterprises. These highlighted the importance of cooperative membership, institutional networks, and prior performance in determining survival outcomes. The review identifies a clear gap in the literature on the survival of wine sector firms, particularly in Central and Eastern Europe. The findings support the relevance of survival analysis in agricultural economics and provide a conceptual basis for future empirical studies on Hungarian grape and wine enterprises. The findings also provide methodological guidance for future empirical research and may support policy discussions related to the resilience of wine-producing enterprises.

Keywords: survival analysis; agricultural enterprises; firm exit; wine sector; systematic literature review

INTRODUCTION

Agricultural enterprises play a crucial role in sustaining rural economies, ensuring national food security, and maintaining socio-economic stability in many regions (Nugroho & Lakner, 2022; Fresco et al., 2021; Pawlak & Kołodziejczak, 2020). In Hungary, the agricultural sector has undergone profound structural changes over the past seven decades, shaped by land reforms, socialist collectivization, and the post-socialist transition to a market economy (Swain & Hamza, 2023; Lennert & Farkas, 2020). Despite these transformations, the long-term viability of agricultural businesses remains a critical policy and research concern, particularly in sectors such as viticulture, which are exposed to market fluctuations, environmental uncertainties, and evolving institutional frameworks (Gomes et al., 2021; Russo et al., 2021).

Understanding why some agricultural enterprises survive while others exit the market is increasingly important for decision-makers, researchers, and farm operators. Survival analysis has emerged as a valuable statistical tool in economics for examining firm longevity, exit probability, and resilience in the face of various external and internal shocks (*Afin et al.*, 2025; *Ronen*, 2024). While widely used in medical research and human sciences (*Beis et al.*, 2024; *Allison*, 2014), its application in agricultural economics, especially at the enterprise level, remains limited and fragmented (*Morán Santamaría et al.*, 2024; *Kramer et al.*, 2019). This gap is particularly acute in the context of wine-producing enterprises, where long production cycles, branding strategies, and international competition create unique survival challenges.

In agricultural settings, survival analysis enables a time-dependent, event-based examination of farm dynamics. Unlike cross-sectional studies, it captures both the duration and the risk of exit, while accounting for censored observations – i.e., farms that remain active at the end of the observation period. This methodological strength is particularly relevant in agriculture, where data incompleteness (*Onofri et al.*, 2018), ownership changes, and sectoral volatility (*Hansson & Nilsson*, 2021; *Corsi et al.*, 2021) are frequent. Moreover, survival models can incorporate a wide range of covariates, including demographic attributes (e.g., age, education), financial indicators (e.g., return on assets, debt ratios), organizational features (e.g., cooperative membership), and broader institutional or market variables (*Xu & Mai*, 2024; *Grashuis*, 2019).

The ability to quantify these factors and estimate their impact on the probability of firm exit provides a powerful foundation for both theoretical development and evidence-based policy. Popular models such as the Cox proportional hazards model and the Kaplan–Meier estimator enable researchers to assess the relative influence of explanatory variables, compare survival curves across groups, and identify critical thresholds or vulnerabilities. In doing so, survival analysis contributes to a deeper understanding of enterprise-level resilience and offers insights into how policy interventions, market structures, or strategic decisions affect long-term viability.

To address the current research gap, this study presents a systematic literature review of scholarly publications that apply survival analysis in the context of agriculture. Particular emphasis is placed on studies exploring the exit and survival of agricultural enterprises. The review aims to synthesize methodological approaches, summarize key empirical findings, and highlight underexplored areas. This work also serves as a conceptual and methodological foundation for future empirical analysis of Hungarian grape and wine-producing enterprises – an economically and culturally significant but under-researched segment of the agricultural sector.

THEORETICAL FOUNDATIONS OF SURVIVAL ANALYSIS

Survival analysis is a statistical approach used to examine the time until a specific event occurs, such as firm exit or bankruptcy (*Johansson et al.*, 2024). It is closely related to duration analysis and has been widely applied in disciplines such as medicine, engineering, and the social sciences (*Defrancesco et al.*, 2018; *Vance & Geoghegan*, 2002). In economics, survival analysis was first introduced by *Lancaster* (1979) to investigate the duration of unemployment (*Defrancesco et al.*, 2018). Duration analysis is

particularly useful in economic research because it allows researchers to examine how long an entity remains in a given state before an event occurs. Since then, its application has expanded significantly, including studies on firm survival in competitive markets (Rousselière, 2019; Valette *et al.*, 2018).

Survival models estimate the hazard rate, which represents the conditional probability that an event will occur within a given time interval. In economic contexts, these models help identify the likelihood and determinants of firm persistence or exit relative to competitors (Johansson *et al.*, 2024). The literature distinguishes between continuous-time parametric models (e.g., exponential, Weibull), semi-parametric models (e.g., Cox regression), and discrete-time hazard models (Singer & Willett, 2003; Defrancesco *et al.*, 2018). The choice between continuous and discrete-time frameworks typically depends on the nature of the survival time being analyzed (Demaris, 2004).

METHODOLOGY

A systematic literature review is a method used to identify, evaluate, and analyze published research on a specific topic. It involves a thorough search for relevant studies (Kataike & Gellynck, 2018). Both Kataike and Gellynck (2018) and Kahn *et al.* (2003) outlined five steps to carry out this process.

1. Planning - Formulate framework questions for the research
2. Searching - Search for relevant studies
3. Screening - Determine inclusion criteria
4. Extraction and synthesis - Summarize the results
5. Report - Interpret the results.

These steps were methodically followed in this study to ensure rigor, transparency, and consistency in the literature review process.

Planning

This review aims to synthesize insights from existing empirical research using survival analysis to understand the factors that influence market survival and exit, initially focusing on grape and wine-producing enterprises. However, a systematic search revealed a nearly complete absence of such studies specific to the viticulture and winemaking sector. As a result, the scope of the review was expanded to include agricultural enterprises more broadly. Survival analysis studies in this wider domain were examined to identify transferable findings and methodological patterns relevant to the original research goal.

Searching

A key goal of a systematic literature review is to gather and evaluate as many relevant sources as possible to ensure comprehensiveness and reduce selection bias (Khan *et al.*, 2003). Searching across multiple scientific databases enhances the breadth of coverage and increases the likelihood of identifying pertinent studies. However, this

approach may also lead to duplication of records, which requires careful management.

In this review, two major academic databases were used: Web of Science and ScienceDirect. To construct precise and effective search queries, Boolean operators were applied to define logical relationships between search terms:

AND = exact matching of terms

OR = choice between synonym groups

„” = search for a specific term

* = replace any number of characters

() = create a search order (Gelencsér *et al.*, 2022)

Following multiple refinements of keywords and Boolean logic, the final search expression was constructed as:

(„Survival analysis” OR „Survival method” OR „Overlapping generations model” OR „Competing risks model”) AND („Wine*” OR „Vine*” OR „Agribusiness” OR „Agricultur*” OR „Farm*”).

Since survival analysis is not the only method applied in economic studies to investigate market entry and retention, the search strategy was expanded to include related models, such as the Overlapping Generations Model (OGM) and the competing risks model. Although the Overlapping Generations Model is not a survival analysis method in a strict statistical sense, it was included during the exploratory search phase to ensure that studies addressing long-term structural persistence of agricultural enterprises were not overlooked. However, none of the final studies included in the review applied this model as the primary analytical framework for firm survival. The OGM, originally developed by Paul Samuelson, captures intergenerational economic dynamics and long-term structural effects (Weil, 2008). The competing risks model represents a specific form of survival analysis that accounts for the possibility of multiple, mutually exclusive events influencing the timing of an outcome (Wolbers *et al.*, 2014).

Furthermore, due to the lack of sufficient results related specifically to grape and wine-producing farms, the scope of the search was broadened to encompass studies focusing on other segments of the agricultural sector.

Screening

The search was conducted in two major academic databases, Web of Science and ScienceDirect, using the search string defined above in both platforms.

ScienceDirect

The initial search in the ScienceDirect database yielded a total of 6,116 results. To narrow down the scope and improve relevance, the following filters were applied using the platform’s built-in filtering tools:

Year: 2014-2024 (3564)

Article type:

Review articles

Research articles (3137)

Subject area:

Agricultural and Biological Science
Environmental Science
Economics, Econometrics and Finance
Social Science (2095)

Following the application of these filters, the titles of the resulting publications were screened for relevance, and 67 studies were selected for further review and download.

Web of Science

The Web of Science database yielded fewer results, with a total of 462 articles matching the predefined search terms. To refine the results and enhance relevance, the following filters were subsequently applied:

Year: 2024-2014 (297)

Document type:

Article
Review Article (293)

Web of Science Categories:

Ecology
Environmental Studies
Economics
Multidisciplinary Science
Agricultural Economics Policy
Agriculture Multidisciplinary
Statistics Probability
Regional Urban Planning
Business
Management Science
Other areas

After applying the filters, the titles of the resulting publications were screened for relevance, and the abstracts of 40 selected studies were subsequently downloaded for further evaluation.

Rayyan.ai

The selected publications were uploaded to the Rayyan.ai platform to support a transparent and structured review process. Rayyan is designed explicitly for systematic literature reviews and meta-analyses, offering functionalities that facilitate screening and organization.

Duplicate records were automatically identified by the platform, resulting in the removal of four duplicates. The remaining 137 abstracts were then screened and categorized into three groups: include, maybe, and exclude. Most of the excluded records were unrelated to economics or agriculture. Following this screening process, a total of 20 publications were retained for inclusion based on the predefined eligibility criteria (*Table 1*).

Table 1: Defining criteria

Quality criteria	Reason for inclusion/exclusion
Eligibility criteria	
Year of publication	Publications were published between 2014-2024
Language of publication	Most scientific journals are published in English.
Topic	Focus on the factors influencing the survival and market entry and exit of economic actors in the field of agriculture to narrow the research question and synthesize relevant results.
Scientifically published articles	Provide more rigorous knowledge in the field of agricultural enterprises and the factors influencing their market survival, market entry and exit
Exclusion criteria	
Publications in other disciplines	The use of the survival method is popular, even more so, in other disciplines, such as medicine, veterinary medicine, herbal medicine, agriculture, etc.
Publications in other sectors	In the field of economics, survival analysis is popular in research on finance and society.
Conference proceedings, books, theses, reports	To ensure quality and consistency, all articles are peer-reviewed.

Extraction and synthesis

Various approaches exist for synthesizing results in systematic literature reviews (Kataike & Gellynck, 2018). The present review focused on identifying studies that applied survival analysis – or other relevant quantitative methods – to agricultural enterprises, with the aim of uncovering factors influencing their market survival or exit.

Of the 20 studies retained after abstract screening, 13 publications met all predefined eligibility criteria and were included in the final synthesis. Although the initial number of potentially relevant studies was substantial, the strict application of inclusion and exclusion criteria significantly narrowed the sample. This outcome highlights the limited availability of international research specifically addressing the survival dynamics of agricultural enterprises – particularly within the wine sector.

Nonetheless, such narrowing is not uncommon in high-quality systematic literature reviews in agricultural economics. For instance, *Abdul-Majid et al. (2024)* retained 30 publications from an initial 388 results in their review on the effects of technological innovation on farmers' well-being. Similarly, *Miranda et al. (2023)* included 36 out of 285 articles in their analysis of agri-food business models, while *Borda et al. (2023)* selected 55 studies from an initial 90 in their investigation of generational change in agriculture.

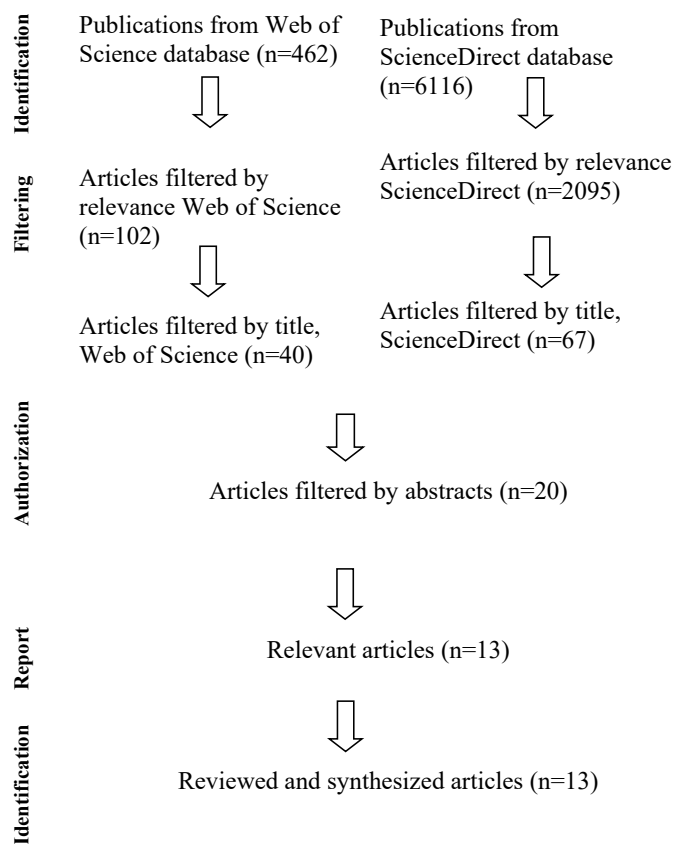
It is also worth noting the widely cited review by *Stewart et al.* (2015), which – despite being published outside of a top-tier journal – remains influential. Their study synthesized 19 relevant publications on the role of training, innovation, and technology in improving the well-being and food security of African smallholder farmers.

These examples demonstrate that the scientific merit of a systematic review lies not in the number of studies included, but in the methodological rigor and clarity with which the literature is evaluated.

Report

Based on the predefined research question, as well as the keywords and search terms applied, all publications unrelated to the study scope were excluded. The most relevant scientific articles were identified through a structured filtering process. The steps of the review protocol and the corresponding numerical results are summarized in *Figure 1*.

Figure 1: Searching-Rating Taxonomy Diagram



RESULTS

The final set of 13 publications included in the review was evaluated based on journal quality and disciplinary relevance, as summarized in *Table 2*. Eight articles (62%) were published in Q1-ranked journals, four (31%) in Q2, and only one (7%) appeared in a Q3 outlet, indicating that the majority of the selected studies originate from high-impact publication venues.

Table 2: Classification of publications

Author	Year	Journal	Field	Classification
<i>Liu et al.</i>	2014	Technological Forecasting and Social Change	Management of Technology and Innovation	Q1
<i>Eskander & Barbier</i>	2017	Ecological Economics	Economics and Econometrics	Q1
<i>Defrancesco et al.</i>	2018	Land Use Policy	Agricultural and Biological Sciences	Q1
<i>Kim et al.</i>	2018	European Review of Agricultural Economics	Economics and Econometrics	Q1
<i>Valette et al.</i>	2018	Journal of Wine Economics	Business, Management and Accounting (miscellaneous)	Q2
<i>Khataza et al.</i>	2018	Technological Forecasting and Social Change	Management of Technology and Innovation	Q1
<i>Wencong & Kwasi</i>	2019	Land Use Policy	Agricultural and Biological Sciences	Q1
<i>Grasbuis</i>	2019	Agribusiness	Economics and Econometrics	Q2
<i>Rousselière</i>	2019	Journal of Quantitative Economics		Q3
<i>Nolte</i>	2020	Applied Geography	Geography, Planning and Development	Q1
<i>Olmos et al.</i>	2021	British Food Journal	Business, Management and Accounting (miscellaneous)	Q2
<i>Lou et al.</i>	2023	Journal of Agricultural and Resource Economics	Economics and Econometrics	Q2
<i>Fertő et al.</i>	2024	Agricultural System	Agronomy and Crop Science	Q1

In terms of disciplinary classification, the journals predominantly belonged to the fields of economics and econometrics, as well as agricultural and biological sciences, and business and management, reflecting the interdisciplinary nature of survival analysis in agricultural enterprise research.

As part of the synthesis, the selected studies were examined with respect to their geographical focus, temporal scope, sample size, and data sources. These characteristics provide insight into the contextual diversity and empirical depth of the reviewed literature. An overview of these attributes is presented in *Table 3*.

Table 3: Geographic Scope, Time Period, Sample Size, and Data Sources of the Reviewed Studies

Reference	Location	Time period	Sample	Source
<i>Liu et al.</i> (2014)	China	1985-2005	9928 patents	China State Intellectual Property Office (SIPO)
<i>Eskander & Barbier</i> (2017)	Bangladesh	2000, 2005, 2010	7440, 10080, 10200 farms	Household Income and Expenditure Survey, questionnaire
<i>Defrancesco et al.</i> (2018)	Italy, Veneto	2000-2015	2922 farms	Official regional registers
<i>Kim et al.</i> (2018)	Kansas	1993-2015	41340 farming	Kansas Farm Management Association (KFMA)
<i>Valette et al.</i> (2018)	France	2009-2014	365 cooperatives, 586 companies	CCVF, AGEVE, French Ministry of Agriculture
<i>Khataza et al.</i> (2018)	Kasungu and Mzimba districts in Malawi	2013/14 growing season	340 farms	Questionnaire; Administrative Delimitation of the Ministry of Agriculture
<i>Wencong & Kwasi</i> (2019)	Ghana	2013-2014	1727 farmers	Survey of Large and Medium Farmers and Agricultural Mechanization, questionnaire
<i>Grashuis</i> (2019)	USA	2005-2018	950 companies	USDA, Rural Development Cooperation Programs (USA) and Annual Publication
<i>Rousselière</i> (2019)	France	1984-2006	1631 cooperatives, 7644 non-cooperative enterprises	French Ministry of Agriculture, Annual Business Survey

Reference	Location		Sample	Source
Nolte (2020)	International (Africa)		1915 projects	Land Matrix Initiative (LMI)
Olmos <i>et al.</i> (2021)	Spain, Rioja	From the initiation of the enterprise's winemaking activity until its exit from the market (complete observations), or until the end of the study period, 31 May 2020.	123 wineries	Rioja Designation of Origin Regulatory Council (580 wineries), structured questionnaire
Lou <i>et al.</i> (2023)	New Zealand	1989-2019	558 connections	United Nations Merchandise Trade Statistics Database, WDI, CEPII, FAO, WHO, New Zealand Ministry, Primary Industries Website, ILO, World Bank.
Fertő <i>et al.</i> (2024)	17 post-communist Central and Eastern European countries	2007-2019	16990 companies	van Dijk ORBIS Office Database

The descriptive characteristics of the reviewed studies are presented in Table 3, including their geographic scope, study period, sample size, and data sources. A total of five studies were conducted in Europe, among which two focused specifically on the wine sector.

Valette et al. (2018) investigated the survival rates of French wine cooperatives compared to individual enterprises between 2009 and 2014, drawing data from the Confederation of French Wine Cooperatives (CCVD), the General Association of French Wines (AGEVE), and the French Ministry of Agriculture.

Olmos et al. (2021) analyzed the survival of 123 wineries in Spain's Rioja region, from their establishment to market exit or up to May 31, 2020. The study used data

collected via structured questionnaires, sourced with the support of the Rioja Designation of Origin Regulatory Council.

In terms of temporal coverage, most studies applied a single continuous observation window. The longest study periods were observed in *Kim et al.* (2018) and *Rousselière* (2019), both spanning 22 years. *Olmos et al.* (2021) applied firm-specific start dates, likely reaching back to pre-1998 in some cases. Sample sizes ranged from 123 (*Olmos et al.*, 2021) to 41,340 observations (*Kim et al.*, 2018).

While the majority of studies focused on farm- or firm-level survival in agriculture, two exceptions were identified: *Liu et al.* (2014) examined the evolution of agricultural patent value in China, and *Nolte* (2020) investigated the failure dynamics of land-based investment projects, focusing on project-level rather than enterprise-level outcomes.

Appendix 1 displays the analytical methods and explanatory variables used in the reviewed publications. The studies employed various survival analysis techniques – including parametric, semi-parametric, and discrete-time models – based on data structure and research goals. A wide range of covariates was also identified, such as demographic characteristics (e.g., age, education), financial indicators (e.g., return on assets, debt ratios), organizational features (e.g., cooperative membership), and contextual or institutional variables.

As shown in Appendix 1, the reviewed studies applied a range of survival analysis techniques adapted to the structure of their respective datasets. The sample size, time span, and the number and type of explanatory variables primarily influenced the selection of analytical models.

The Cox proportional hazards model emerged as the most frequently used method, appearing in multiple studies (e.g., *Liu et al.*, 2014; *Kim et al.*, 2018; *Valette et al.*, 2018; *Khataza et al.*, 2018; *Grashuis*, 2019; *Olmos et al.*, 2021). This semi-parametric model is widely applied in both medical and economic research, enabling the simultaneous assessment of multiple covariates – both continuous and categorical – on the hazard function (*Cox*, 1972).

Several studies also applied the Kaplan–Meier estimator, particularly in cases involving censored data (*DeFrancesco et al.*, 2018; *Valette et al.*, 2018; *Olmos et al.*, 2021; *Fertő et al.*, 2024). This non-parametric method allows the estimation of survival probabilities over time and is typically visualized through step functions. In addition, topic-specific models – such as discrete-time hazard models or Bayesian approaches – were employed in a few cases to reflect the data structure or the complexity of the research questions.

The explanatory variables used across the studies were aligned with the research objectives and available datasets. These included:

- Demographic factors (e.g., age, gender, education),
- Financial indicators (e.g., return on assets, solvency ratio, debt ratio),
- Organizational and structural variables (e.g., firm size, cooperative membership, export orientation),
- Institutional and regional characteristics.

Data sources varied: most studies relied on official secondary datasets (e.g., *Liu et al.*, 2014; *Kim et al.*, 2018; *Grashuis*, 2019; *Rousselière*, 2019; *Fertő et al.*, 2024), while

others used primary survey data (e.g., *Eskander & Barbier*, 2017; *Khataza et al.*, 2018; *Wencong & Kwasi*, 2019). This methodological diversity reflects the broad applicability of survival analysis in agricultural economics. Across the studies, dummy variables were commonly employed to encode categorical predictors, allowing for binary representation in regression models.

Among the reviewed publications, the studies by *Valette et al.* (2018) and *Olmos et al.* (2021) were particularly relevant to the present research focus. *Valette et al.* (2018) demonstrated that French wine cooperatives exhibited longer survival times than individual enterprises, a finding attributed to more effective environmental adaptation and internal knowledge transfer. *Olmos et al.* (2021) examining wineries in Spain's Rioja region, found that institutional embeddedness and prior financial performance were positively associated with the likelihood of survival. Interestingly, variables such as R&D expenditure and export activity did not significantly influence survival outcomes in that context.

In summary, the methodological approaches and empirical findings presented in the 13 reviewed studies confirm the relevance and versatility of survival analysis for investigating firm dynamics in the agricultural sector. These results support the application of survival models in future research on Hungarian grape and wine enterprises. Taken together, the reviewed studies reveal several recurring patterns, including the dominant use of Cox proportional hazards models and the frequent role of financial performance, firm size, and institutional relationships as determinants of enterprise survival.

DISCUSSION

The findings of this systematic review identify several recurring patterns across the reviewed studies, in terms of both methodological choices and empirical results. These patterns not only reflect the current state of survival analysis in agricultural economics but also emphasise areas where further research is warranted.

Methodological convergence. The reviewed literature demonstrates a clear methodological consensus around semi-parametric approaches, especially the Cox proportional hazards model, which was utilised in most studies (e.g., *Liu et al.*, 2014; *Kim et al.*, 2018; *Valette et al.*, 2018; *Grashuis*, 2019; *Olmos et al.*, 2021). This prevalence aligns with broader trends in applied econometrics, where the Cox model is preferred for its flexibility and minimal distributional assumptions. The Kaplan–Meier estimator is often presented alongside it as a descriptive complement, allowing visual comparison of survival curves across groups. Parametric and Bayesian approaches, although less frequently used, were adopted when theoretical assumptions about the hazard function could be justified or when data complexity necessitated greater modelling flexibility (*Rousselière*, 2019). This methodological agreement indicates that survival analysis in agricultural economics has achieved a certain level of maturity, though it also highlights a relative underexploration of more recent extensions, such as time-varying covariate models or competing risks frameworks.

Empirical patterns and contextual heterogeneity. Across the reviewed studies, a consistent set of firm-level determinants emerged as significant predictors of survival:

financial performance indicators (e.g., return on assets, solvency ratios), firm size, age at entry, and organizational form, particularly cooperative membership. These findings align with traditional industrial organisation theory, where resource availability and institutional embeddedness are seen as key buffers against exit risk. At the same time, the evidence is not consistent. Notably, *Olmos et al.* (2021) found that R&D expenditure and export activity did not significantly influence survival among Spanish wineries, a result probably explained by the specific institutional context of the Rioja designation of origin system, where regulatory protection and collective reputation may lessen the marginal survival benefit of individual innovation efforts. This contextual sensitivity emphasises the importance of interpreting survival analysis findings within their specific sectoral and institutional frameworks, rather than applying them broadly across agricultural settings.

Geographical and sectoral gaps. Despite the extensive review of the literature, a clear geographical imbalance remains. Most studies were carried out in North America, East Asia, and Western Europe, leaving Central and Eastern Europe underrepresented, even though the region has firm-level administrative datasets and experiences significant volatility in the agricultural sector following the post-socialist transition. Specifically, in the wine industry, only two of the thirteen reviewed studies focused on wine-producing companies, both from Western Europe (France and Spain). This gap is especially important given the specific features of Hungary's grape and wine sector, where small and medium-sized enterprises face market uncertainty, subsidy reliance, and changing regulations. This review highlights a valuable research opportunity: using established survival analysis techniques (like the Cox proportional hazards model or accelerated failure time models) on Hungarian wine enterprise data could produce both academically innovative and policy-important insights.

CONCLUSION

This systematic review examined how survival analysis has been applied in agricultural economics to study firm longevity and market exit. Thirteen peer-reviewed studies published between 2014 and 2024 were identified and synthesised, revealing a coherent body of literature with clear methodological preferences and recurring empirical findings.

The review confirms that survival analysis offers a robust and versatile framework for understanding enterprise dynamics in agriculture. The identified patterns – methodological convergence around Cox-type models, the consistent relevance of financial and organisational factors, and the context-dependence of innovation-related variables – provide a solid conceptual foundation for future empirical work.

This review enriches the existing literature by consolidating methodological practices and empirical insights, and by explicitly identifying the underexplored intersection of survival analysis, the wine sector, and Central and Eastern Europe. It provides a conceptual and methodological basis for upcoming empirical studies on Hungarian grape and wine enterprises – research that could yield valuable insights for policymakers and practitioners seeking to enhance sectoral resilience amid market and environmental uncertainties.

Limitations and Future Research

This review has several limitations that should be acknowledged. First, the literature search relied on two major academic databases, Web of Science and ScienceDirect, which may not include all relevant publications available in other databases. Second, the strict inclusion criteria – such as focusing only on peer-reviewed journal articles ranked at least Q3 – reduced the number of eligible studies.

Future research could expand the scope of database searches and further explore the application of survival analysis in specific agricultural subsectors. In particular, empirical studies examining the survival dynamics of wine-producing enterprises in Central and Eastern Europe remain very limited. Applying survival models such as the Cox proportional hazards model or accelerated failure time models could provide valuable insights into the factors influencing the long-term viability of these enterprises.

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APPENDIX

Appendix 1: Analytical Methods and Explanatory Variables Used in the Reviewed Studies

Reference	Factor	Method
<i>Lin et al.</i> (2014)	Patent scope; patent renewal; foreign (dummy); company/firm (dummy); individual (dummy); year dummies; area dummies; breadth; number of inventors; highly important	Weibull and Cox proportional hazards models
<i>Eskander & Barbier</i> (2017)	Conservation investment Human capital investment Land ownership; Leased land; Tenure security; Gender Dummy; Age; Household size; Search members; Students; Years of schooling; agricultural machinery ownership; Agricultural household; Women's scholarship	overlapping generations model
<i>Defrancesco et al.</i> (2018)	2 dummy covariates: signing of the first contract, dichotomous variable: (dummy) 1=farmer is in the target areas when signing the contract; background factors: farm size; whether he increased the area during the contract period (dummy), planting/maintaining shrubs (dummy)(positive environmental attitude), farmer age class, change of owner/occupier (dummy), proxy for neighborhood effect, decision to stay at times.	discrete-time model, Kaplan-Meier estimated survival function
<i>Kim et al.</i> (2018)	Total crop hectares, Operator age, years in operation, (labor input, crop)/(labor input, livestock), non-farm income, debt/asset ratio, land owned/total land, fixed asset decline, last year insured, number of years insured in the last 3 years, in the last 5 years	dynamic panel model, Cox proportional hazards model; duration model, nonparametric model, Kaplan-Meier survival curve, semi-parametric model
<i>Valette et al.</i> (2018)	Sales, number of employees, total assets, net income/sales, return on assets, return on equity, financial leverage, export intensity; Cox model: Cooperatives, size, export, profitability, financial leverage, ROA, ROE, Alsace, Bordeaux, Bourgogne, Loire, South (dummy)	Cox model, Kaplan-Meier estimation
<i>Khataza et al.</i> (2018)	Adoption time, own ruminants, age, gender, education, dependency ratio, farm size, social network member, peer learning, advisor learning, radio communication, livestock index, soil fertility, distance from farm, district, year 2000 dummy, year 2012 dummy	Discrete duration model, Cox model

Reference	Factor	Method
<i>Wencong & Kwasi</i> (2019)	Asset value; Years of education, time to event/staying at risk; Dummy: government support; no government support; worked before becoming a farmer; used to work alongside farming, but no longer; currently works alongside farming; gender of farmer; inheritance related to farming; possible change in land use; member of farming organization/cooperative; Motivation for farming: occurrence of medium and large farms: parents were farmers, inherited the farm, farming to feed the family, farming as a business, earning extra money, supporting a large family	Markov regime switching model, survival analysis terminology
<i>Grashuis</i> (2019)	Demographic characteristics: age, number of members; Financial characteristics: asset turnover ratio, debt ratio, current ratio; Strategic characteristics: trademark owner, service mark owner	Cox model
<i>Rousselière</i> (2019)	Age, 1984-1991 period, 1992-1995 period, 1996-2002 period, 2003-2006 period, previous legal status, number of employees, turnover, tangible investments, intangible investments, uniformity (sectoral diversity), exports, other legal status, limited liability companies and joint stock companies.	Bayesian generalized discrete-time semiparametric hazard model
<i>Nolte</i> (2020)	Investment-specific factors: Size of investment, Type of investment, Ownership structure, Financial endowment, Investor capabilities; Micro-investment context: Social context (poverty, inequality, social conflicts), Institutional context (access to natural resources, political stability, corporate organizational routine, investment environment), Accessibility, Stability, Technological affinity; Macro-investment context: Macroeconomic trends and shocks	Survival analysis
<i>Olmos et al.</i> (2021)	Composition of the senior management team, winery size, R&D intensity, international experience, past performance, relationships with institutions	non-parametric (Kaplan–Meier plot) and semi-parametric survival models (Cox proportional hazards model)
<i>Lou et al.</i> (2023)	multiple, origin, destination, GDP; distance, language, colonial production, credit food security long-distance market	Discrete-time hazard model

Reference	Factor	Method
<i>Fertő et al.</i> (2024)	Joint-stock company < Limited liability company/cooperative; large shareholder ownership; foreign ownership; central state ownership; Return on assets (ROA); Profit margin; Labor productivity; Solvency ratio; Total number of employees; Years of operation; Agricultural area; Employment in agriculture; Agricultural value added; Labor productivity in agriculture; Agricultural trade openness	accelerated failure time model, Nelson-Aalen estimate (cumulative hazard function), Kaplan-Meier survival function, two-level mixed-effects Weibull accelerated failure time model

RENEWABLE AND STIMULATING AGRICULTURE: EXAMINING INNOVATION BEHAVIOUR IN HUNGARIAN AGRICULTURAL ENTERPRISES

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ABSTRACT

Today, the turbulently changing economic and social influences are having a significant impact on the sustainability and innovation policies of companies. The keys to economic efficiency and effectiveness are flexibility, adaptation to change, innovation, modernisation, and implementation of the potential new practices in business. The aim of the empirical research was to assess how the innovation policy of companies in the field of agricultural SMEs evolves in relation to management contribution and employee activity, and what kind of strategic objectives they formulate for the future. The primary survey was conducted in the form of a questionnaire in 2024. The hypotheses formulated in the light of international and national trends were tested with non-parametric statistical methods. The first hypothesis was tested using Wilcoxon rank test, and the second hypothesis was tested using Spearman rank correlation. The main finding of the research shows that the innovation policy and philosophy of agricultural SMEs' operations are significantly influenced by the activation and involvement of employees in innovation processes, and management's efforts to increase employees' motivation. The innovation behaviour of companies in the sector is diverse, however, a significant percentage of companies consider themselves to be innovation-driven, even if their innovation activity is currently stagnating and their innovation performance is expected to remain low in the future. It remains important that similar research is produced that supports the promotion of innovation activity with up-to-date information and strategic considerations.

Keywords: innovation, employee, SME, agriculture, Hungary

JEL codes: D23, O3, O13

INTRODUCTION

Agriculture is a key sector ensuring people's livelihood, as its scope of activity is primarily specialised in animal husbandry and crop production. It also plays a key role in supporting raw materials for other industries. Agriculture not only serves economic and social aspects but also contributes significantly to environmentally conscious farming. That is why the application of innovations is essential for the

sustainable development of agriculture. Innovative solutions contribute to modernising the methods used in the industry, increasing food safety, and the well-being of employees in agriculture. The introduction and acceptance of innovations depend on the corporate culture and the atmosphere created by the manager. The more valuable employees feel, the more willing they are to keep the company's interests in mind and adapt to innovations. This is also true for SMEs operating in agriculture. Preparing employees for innovation is one of the most important aspects of the success of innovation. Despite the small sample size, the practical usefulness of the results lies in the fact that they point to a scientific gap, that the number of domestic research examining innovation behaviour of various industries is still insufficient, despite the fact that this is a current problem. This research seeks to contribute to filling this gap.

The aim of the research was to examine how the innovation behaviour of SMEs operating in the Hungarian agricultural sector changes over time, and how incentives provided by management influence employees' innovation motivation.

LITERATURE REVIEW

The concept of innovation is associated with the name of the economist J. A. Schumpeter, who first mentioned it in his book *The Theory of Economic Development*. The theory is about a new, diverse combination of production factors, which forms basis of all theories dealing with innovation (Bajkó *et al.*, 2020; Lin *et al.*, 2024). The innovation activity in enterprises contributes to economic growth and development and ensures access to new markets and competitive advantage in industry. It is important for SMEs to secure their market position, leverage their existing resources, and gain new resources or competitive advantage (Carrasco-Carvajal *et al.*, 2023). In Central Europe, SMEs contribute significantly to promoting employment, yet they lag far behind the performance of Western European SMEs in terms of productivity and market competitiveness. The reason for the lag can be traced back to technological disadvantages, the use of old marketing methods, and low innovation activity (Gódány *et al.*, 2021). The economic structure, innovation activity and competitiveness of Central and Eastern European countries are similar (Szabó & Hortoványi, 2021). In recent years, various methods have been used to support innovation, the development of the economy, education and research, and entrepreneurship (Mester & Gavriluț, 2024). According to Kvilinski *et al.* (2025), by aligning the innovation ecosystem, trade policy and intellectual property frameworks of the Visegrad countries, there is an opportunity to attract innovation-driven and sustainable investments. Innovation ecosystems play a prominent role in green investments therefore decision-makers need to develop support programs that specifically target the economic utilization of research. According to Ivanová (2017), small and medium-sized enterprises are an important part of the Slovak economy, but despite this, economic conditions are not adequate, and the entrepreneurial environment is not motivating. The lack of financial support limits the innovative activities of companies. In the Slovak SME sector, the most common source of financing for innovations is company profits. Dobos & Csizsárik-Kocsir (2024) found

that it is also important for Hungarian and Slovak SMEs to participate in successful projects, thereby ensuring their competitiveness in the market. For Slovak SMEs, an innovative approach and participation in innovative projects are much more important than for Hungarian SMEs. This shows that Slovak SMEs are more inclined to innovate and launch innovative projects. The application of innovative solutions makes it possible to modernise companies operating in agriculture. Partnerships, technological innovations, and sharing knowledge support the development of SMEs in agriculture (Kondrat, 2025). The development rate of the Hungarian agricultural sector shows a varied picture, with developed and developing areas. Innovation can be a solution to reduce regional inequalities (Kelemen et al., 2023). Angyal & Vajnai (2025) emphasize in their research that companies often underestimate the importance of aligning innovation initiatives with market needs and long-term strategic goals. They highlight further research in innovation, networking, and collaboration. Popp et al. (2025) highlight that the goal is to support the increase in the number of active producing agricultural enterprises. These enterprises are trying to implement innovative developments. Innovative solutions can ensure the sustainability and competitiveness of the domestic agricultural sector. In agriculture, innovation is manifested in the application of new agricultural technologies, the development of markets, the efficient allocation of resources, and the change of organisational structures (Ofosu-Ampong et al., 2025). Challenges affecting agriculture include financing difficulties, obstacles to sustainable operations, climate change risks, volatile pricing policies, and financial insecurity (Fan & Rue, 2020). According to Chindasombatcharoen et al. (2024), the main barriers to agricultural innovations are access to financial resources, lack of knowledge and competencies, infrastructural and regulatory problems, and psychological problems. The size and age of enterprises have an impact on their innovation activity. Large companies have more resources to support innovation and carry out R&D activities. Large companies often invest in radical innovation, creating a completely new product or process. Small companies typically invest in incremental innovations, meaning they develop and improve an existing product or process (Acemoglu et al., 2022). According to Virglerova et al. (2025), medium-sized enterprises are more open to incorporating innovation into their strategy than smaller enterprises. The strategic importance of innovation is more evident in companies that are less than five years old, and companies that also engage in export activities place greater emphasis on innovation. Small companies react quickly and flexibly to market needs, but they are less likely to participate in large-scale innovation projects. The age of the company and its business experience also affect innovation. Companies that have been on the market for a long time have a better understanding of consumer needs. Managers also play a significant role in the innovation behaviour of employees (Naparín & Astuti, 2025). They develop the innovation strategy they create the corporate culture necessary to accept innovation. The basis of a corporate culture that supports innovation is the involvement of employees in innovation and the development of trust within the company (Karácsony et al., 2025; Avelar et al., 2024). Employees' innovation behaviour also influences the success of a company's innovation activities (Bindel Sibassaba et al., 2025). SMEs support innovation provides the right conditions for new methods. Innovation

management methods and leadership techniques are built on emphasizing innovation and encouraging new, creative solutions. This requires the introduction of new personnel development methods, the implementation of knowledge management, and corporate behaviour that supports innovation. The result of innovation is an improved, changed or completely new solution (Lesáková, 2014). According to Dayan *et al.* (2024), managers play a key role in developing the innovation capacity of SMEs. They should provide training programmes that support critical thinking and breaking away from routines. They must provide an environment conducive to innovation and encourage employees to think of new ideas. According to Menzies *et al.* (2025), the development of a loyalty-based HR management system plays an important role in supporting innovation. Resources invested in employee training and development pay off, which contributes to workforce retention. According to Yesuf *et al.* (2024), the innovation behaviour of companies depends on the creativity of employees therefore, measures taken to improve the working environment and develop employees' creativity are very important. According to Juarez *et al.* (2024), employee training and knowledge development are essential for the company's effective innovation activities. Employees' knowledge and competencies are important for implementing innovation practices (Janasz *et al.*, 2022). According to Mukhiyayeva *et al.* (2024), innovation activity is the key to business success, yet few resources are devoted to supporting innovation, which is affected by the lack of strategic planning and the innovation attitude of managers. Mardonbek (2025) states that technological and organisational innovation play an essential role in economic development for agricultural SMEs. Innovations in animal husbandry and crop production promote employment and GDP growth. The biggest obstacle to innovations is the lack of financial resources and interorganisational relationships. According to Shahini (2025), employee commitment is essential in agricultural SMEs. Modern agricultural enterprises must provide an environment that encourages the active participation of employees in decision-making and the development of corporate culture, and the effective adaptation of modern technologies and innovative solutions. Innovation in the life of SMEs means openness to new technological solutions and partnerships, a willingness to take risks and explore development opportunities, and cooperation to create creative solutions (Ferincz, 2012).

MATERIALS AND METHODS

For the empirical research, a quantitative research method was applied through an online questionnaire survey. During the survey, it was ensured the anonymity of the potential respondent and fully complied with data protection regulations. Participation in the survey was voluntary. The data from the survey will be used for research purposes. The sampling method was purposive sampling, which means that the sample was selected based on predetermined criteria. The target group was corporate representatives of SMEs operating in the Hungarian agricultural sector. Data collection took place in 2024. The questions in the questionnaire can be divided into three main groups. The first half of questionnaire contained questions discussing basic information about the enterprise, such as size, and year of establishment. The

second half of the questionnaire contained questions discussing the innovation behaviour of enterprises. The third part of the questionnaire discussed the tools used to encourage innovative behaviour among employees. The questionnaire consisted of scale-type questions, with the aim of identifying and assessing respondent preferences. The scale-type questions were evaluated on a seven-point Likert scale, where 1 meant slightly or not at all important and 7 meant completely or completely important. The validity of the hypotheses was examined in SPSS. Non-parametric statistical tests were used to verify the validity of the hypotheses.

To test hypothesis H1, the Wilcoxon rank test was used, which is suitable for comparing variables from the same database over time and detecting differences between them. We were able to perform the statistical test because the variables are measured on an ordinal scale, the data come from the same sample, and the distribution of differences is symmetrical.

To test hypothesis H2, the Spearman rank correlation analysis was used, which shows the extent to which the large of one variable determines the large of the other variable, as well as the direction and strength of the relationship between the variables. We were able to perform the statistical test because the variables are measured on an ordinal scale, there is a monotonic relationship between the variables, their values increase proportionally, and they allow for paired, related observations.

The aim of the research was to examine the innovation willingness of Hungarian SMEs operating in agriculture and to map out the means by which they ensure the commitment and motivation of employees towards innovation. Based on the aim, the following research questions were formulated:

RQ1: Does the innovation activity and propensity of agricultural companies change over time?

RQ2: To what extent and by what means can managers encourage employees to develop their innovative behaviour?

We examined the following hypotheses:

- H0: There is no difference between current and future innovation activity of Hungarian agricultural SMEs.
- H1: There is a significant difference between current and future innovation activity of Hungarian agricultural SMEs.
- H0: There is no correlation between the improvements provided by management to increase employee motivation.
- H2: There is a significant correlation between the improvements provided by management to increase employee motivation.

Sample

The sample is presented in *Table 1*. A total of $n=103$ enterprises participated in the research. 34.6% of the enterprises are small enterprises (<50 employees), 32.7% are medium-sized enterprises (<250 employees), and 31.7% are micro-enterprises (<10 employees). 60.2% of enterprises were established between 1990 and 2010, 25.2% between 2011 and 2024, and 13.6% between 1960 and 1989.

Table 1: Basic information about the sample (N=103)

		Frequency	Percent
Size	Micro enterprise	33	31.7%
	Small enterprise	36	34.6%
	Medium enterprise	34	32.7%
Year of establishment	between 1960 and 1989	14	13.6%
	between 1990 and 2010	62	60.2%
	between 2011 and 2024	26	25.2%

RESULTS AND DISCUSSION

Table 2. presents the results of the statistical test for the alternative hypothesis H0 and the related hypothesis H1. The table shows the difference between enterprises' current innovation activity and their future innovation activity using ranks. The significant level, i.e., $p=0.000$, satisfies the $p<0.05$ condition, so it can be stated that there is a significant difference between the enterprises in the assessment of innovation activity. Overall, based on the Wilcoxon rank test ($Z=-3.726$; $p=0.000$), it can be said that there is a significant difference between enterprises regarding the future application of innovations. In the case of 31 enterprises currently engaged in innovation activities, it can be stated that the willingness to engage in innovation activities in the future is lower. In the case of 8 enterprises currently engaged in innovation activities, it can be stated that there is a higher willingness to engage in innovation activities in the future. In the case of 64 enterprises, it can be stated that their willingness to innovate is stagnant and unchanged. During the hypothesis test, it was found that enterprises evaluate their future innovation activities to different degrees. Of the 103 enterprises included in the survey, only 8 enterprises would like to develop their innovation activities, while 31 enterprises show moderate willingness to innovate in the future, and the willingness of most enterprises, i.e., 64, to innovate remains unchanged. In the light of this, the null hypothesis was rejected, and the validity of hypothesis H1 was confirmed.

Table 2: Hypothesis testing based on Wilcoxon rank test

Current innovation activity Innovation activity in the future		N	Mean Rank	Sum of Ranks
	Negative Ranks	31 ^a	20.26	628.00
	Positive Ranks	8 ^b	19.00	152.00
	Ties	64 ^c		
	Total	103		
^a Current innovation activity > Innovation activity in the future				
^b Current innovation activity < Innovation activity in the future				
^c Current innovation activity = Innovation activity in the future				
Z				-3.726 ^b
Asymp. Sig. (2-tailed)				.000
a. Wilcoxon Signed Ranks Test				
b. Based on positive ranks				

In line with the results, we believe that the continuation of innovation activity is the basis for the development of SMEs, which is also emphasized by *Carrasco-Carvajal et al.* (2023). The competitiveness of SMEs depends to a significant extent on their willingness and activity to innovate. *Gódný et al.* (2021) see the problems of SME development in outdated methods and moderate innovation activity. However, *Mester and Gavrilut* (2024) emphasize that in recent times, Central and European countries have made significant developments and concrete steps to promote their innovation activities. *Kwilinski et al.* (2025) agree with this, and emphasize the role of decision-makers, who can achieve even greater positive effects through support programs, coordination of the innovation ecosystem, trade policy and intellectual property frameworks to promote innovation willingness and activity. *Chindasombatcharoen et al.* (2024) also believes that the constraints to agricultural innovations can be linked to support difficulties, lack of competence, regulatory and infrastructure issues. Innovation is a potential tool for the modernization of SMEs, including agricultural enterprises (*Kondrat*, 2025), which should not be neglected. According to *Mardonbek* (2025), innovations in animal husbandry and crop production would significantly transform the innovation activities of agricultural companies. Based on our results, it can be said that the innovation activity of agricultural SMEs shows a fluctuating tendency. The majority of companies focus more on stability and maintaining the status quo. The stagnation of innovation activity can be linked to several factors, which we could associate with the findings made at level of assumptions or in the literature.

Table 3. presents the variables included in the H2 hypothesis test with descriptive statistics. 24.0% of enterprises (Md=4; Mn=3.72) motivate employees by introducing employee development practises to increase their willingness to innovate. 21.2% of enterprises (Md=5; Mn=4.10) consider it important to establish a stable reward system to enhance innovation behaviour and increase productivity. 20.2% of enterprises (Md=4; Mn=4.00) believe in developing a task planning and employee/team performance monitoring system to motivate employees and increase their willingness to innovate.

Table 3: Descriptive Statistics

	Percentage	Mean Mn	Mode Md	Median	Std. Deviation
V1: Practices and programs aimed at HR development	24.0%	3.72	4	4	1.774
V2: Reward system to enhance innovation behaviour and increase productivity	21.2%	4.10	5	4	1.791
V3: Task planning and employee/team perfor- mance monitoring system	20.2%	4.00	4	4	1.815

Table 4. presents the analysis of the relationship between the variables (V1, V2, V3) included in the hypothesis test using Spearman rank correlation. The aim is to demonstrate the relationship between developments that help increase employee motivation. According to the statistical test, it can be determined that there is a significant correlation between variables V1 and V2 at a significance level of $p=0.000 < 0.01$, $\rho = 0.479^{**}$, which indicates a linear and medium strong relationship. Since $p=0.000$, it can be concluded with a 99.9% probability level that there is a significant correlation between the introduction of practises aimed at employee development and the reward system designed for them that enhances their innovation behaviour and increases their productivity. Employee motivation can be increased proportionally to a moderate extent as a result of both measures. There is a significant correlation between variables V1 and V3 at a significance level of $p=0.000 < 0.01$, $\rho = 0.647^{**}$, which shows a linear and strong relationship. Since $p=0.000$, it can be concluded with a 99.9% probability level that there is a significant correlation between the introduction of practices aimed at employee development and the establishment of a task planning and employee/team performance monitoring system. Employee motivation can be significantly increased proportionally as a result of both measures. There is a significant correlation between variables V2 and V3 at a significance level of $p=0.000 < 0.01$, $\rho = 0.662^{**}$, which shows a linear and strong relationship. Since $p=0.000$, it can be stated with a 99.9% probability level that there is a significant correlation between the development of a task planning and employee/team performance monitoring system and the reward system designed for employees that enhances their innovation behaviour and increases their productivity. Employee motivation can be significantly increased proportionally as a result of both measures. In this light of this, the null hypothesis was rejected, and the validity of hypothesis H2 was confirmed.

Table 4: Hypothesis testing based on Spearman's rank correlation

			V1	V2	V3
Spearman's rho	V1	Correlation Coefficient	1.000	0.479**	0.647**
		Sig. (2-tailed)		0.000	0.000
		N	103	103	103
	V2	Correlation Coefficient	0.479**	1.000	0.662**
		Sig. (2-tailed)	0.000		0.000
		N	103	103	103
	V3	Correlation Coefficient	0.647**	0.662**	1.000
		Sig. (2-tailed)	0.000	0.000	0.000
		N	103	103	103
** Correlation is significant at the 0.01 level (2-tailed)					
V = Variable					
V1: Practices and programs aimed at HR development					
V2: Reward system to enhance innovation behaviour and increase productivity					
V3: Task planning and employee/team performance monitoring system					

Encouraging employees' innovation behaviour (Bindel Sibassaha *et al.*, 2025) and developing their competencies is a key factor in the success of innovations. The managerial attitude (Naparin & Astuti, 2025), the creation of an appropriate work environment (Avelar *et al.*, 2024; Karácsony *et al.*, 2025; Lesáková, 2014) and incentive system support the innovation efforts of enterprises. Dayan *et al.* (2024) specifically emphasize the leadership approach in promoting innovation activity and work environment favourable to innovation. It is important to provide training programs for employees that help them learn new things and break away from the usual. Yesuf *et al.* (2024), Juárez *et al.* (2024) and Janas *et al.* (2022) also hold a similar view. Menzies *et al.* (2025) also believe in the power of training and see the future in the development of a stable and loyalty-based HR management system. According to Shahini (2025), employee engagement is also an important factor in agricultural companies, which the employer can support and strengthen with modern incentives. Supporting and encouraging employees is essential for accepting changes and innovations. Our results also try to highlight that the leadership attitude towards motivating employees will be the key to strengthening and developing employees' innovative behaviour.

CONCLUSIONS

The economic and social importance of SMEs is unquestionable, which is also true of SMEs operating in the Hungarian agricultural sector. Researchers around the world use different approaches to examine the innovation behaviour of SMEs. However, we believe that there is still a scientific gap that is worth filling with scientific findings. In general, the willingness to innovate in post-socialist countries has lagged behind that of leading European countries. However, regardless of industry, economic activity and company size, pursuing an innovative and sustainable thinking and strategy is becoming increasingly important. In the research, we dealt with the change in the innovation activity of SMEs operating in Hungarian agriculture and the motivation of employees' innovation behaviour. A total of $n=103$ enterprises participated in the research. We believe that this sample size is satisfactory, as we are talking about a less accessible industry. However, it is important to note that one of the constant limitations of questionnaire surveys is reaching the target population, achieving an adequate and analysable sample size and data distortion. Results from a small sample cannot be generalized to an industry, but they can provide valuable information and start a scientific dialogue, encouraging researchers to address the topic more, even from different aspects. A significant proportion of employees work as manual workers, for whom innovation may be particularly important in order to modernise and facilitate their work. Based on the research, we found that enterprises evaluate their innovation behaviour differently. If they are currently engaged in innovative activities, this does not mean that they will continue to be so in the future. More than half of enterprises are stuck at a certain level of innovation, and it is hardly possible to predict how they will get beyond this level. Only 8% of enterprises stated that they would continue their innovation activities in the future. Our research also found that the development of employees' innovation behaviour and motivation can be enhanced depending on the incentive

systems, innovative practises, and training opportunities provided by managers. In the case of agricultural SMEs, it is also important that employees are committed, which ensures their positive attitude towards changes. Decision-makers and practitioners are concerned with promoting the innovation activity of SMEs at a global level. At the same time, experts from the scientific world also try to contribute to the development of the innovation activity of SMEs with the findings made during their studies. Research specialising in countries and industries examines the effectiveness of companies' innovation behaviour in different forms and levels. Future research will focus on issues of sustainability and artificial intelligence, which will also be reflected in companies' innovation efforts.

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CORPORATE CONCENTRATION AND LABOUR CONDITIONS IN HUNGARY'S CEREAL INDUSTRY: 2003–2022 TRENDS AND IMPLICATIONS

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ABSTRACT

This study examines the association between corporate concentration and labour conditions in Hungary's cereal industry from 2003 to 2022, focusing on key labour-related variables. Using data extracted from a Stata database, the analysis was conducted through IBM SPSS 26, applying bivariate correlation tests to assess the relationship between corporate concentration and seven labour condition variables, including wages, working hours, and employment conditions. The results show a significant positive correlation between corporate concentration and gross monthly earnings, monthly wage, overtime, and basic hourly wage. Results suggest that increased market dominance is associated with enhanced financial compensation. However, its association with the number of full-time employees, the age of active workers, and paid holidays remains statistically insignificant, indicating a weaker link to broader employment conditions. It is important to note that these findings, based on correlation analysis, indicate association and do not imply causality. These findings underscore the dual relationship of corporate concentration, revealing how economic benefits can coincide with potential labour market challenges, potentially reshaping employment dynamics and trade union influence.

Keywords: corporate concentration, labour conditions, cereal industry, market power, food industry

INTRODUCTION

The food economy, encompassing both agriculture and its associated industries, plays a critical role in global economic stability. Its significance is driven by factors such as population growth, increasing food demand, and geographical and ecological constraints on food production (Imani Bashokoh & Korani, 2024; Földi et al., 2023). Within the European Union, the food industry is the leading manufacturing sector, contributing substantially to revenue generation, value addition, and employment (Hegyi et al., 2023; Bakucs et al., 2009). In Hungary, this sector plays a pivotal role in sustaining a positive trade balance, with food exports serving as a key driver of economic growth (Toth &

Fertő, 2017). The food industry accounts for approximately 8.8% of Hungary's total exports, demonstrating its strong international competitiveness (Földi et al., 2023). Moreover, Hungary's food production growth rate has consistently surpassed the EU-28 average, with output increasing by 23% from 2010 to 2017, compared to the EU average of 5.6% (Hegyi et al., 2023; Hungarian Ministry of Finance, 2019). As of 2018, Hungary's food industry consisted of approximately 5,400 enterprises, directly employing around 100,000 individuals, or 3.2% of the national workforce, while accounting for 65% of total domestic production (HEPA, 2018). In 2024, the sector employed 145,900 individuals, representing 15% of all manufacturing jobs, making it the second-largest employer among manufacturing sub-sectors (MTI-Hungary Today, 2025).

Corporate Concentration in the Food Industry

The Hungarian food industry operates within a highly concentrated market characterized by limited competition and the dominance of a few large corporations (Čechura et al., 2015; Szczechpaniak et al., 2014; Perekhobzhuk et al., 2013). Since the mid-20th century, corporatisation and ownership restructuring have intensified, leading to a polarized economic structure where large enterprises dominate, while small and micro businesses remain marginal (Imani Bashokob et al., 2025; Hutorov et al., 2022). This concentration has been observed across multiple sectors, including dairy (Bakucs et al., 2009), retail supply chains (Juhász & Stauder, 2006), grocery markets (Špička, 2016), and fruit juice production (Kurmai, 2016). The privatisation and corporatisation of Hungary's food industry accelerated after the early 1990s' economic reforms. By 1996, foreign investors controlled nearly half of the sector's registered capital due to Hungary's early privatisation efforts and strong FDI inflows (Jansik, 2000). By 2007, the four largest food manufacturing firms controlled over 55% of the market, predominantly under international ownership (Diprima, 2023; Kiss, 2014). This shift has resulted in an increasingly globalised and concentrated food sector.

Theoretical Framework and Empirical Context: Linking Concentration to Labour Outcomes

The relationship between market concentration and labour outcomes is predominantly theorised through the lens of monopsony power. In a monopsonistic labour market, a single or a small number of employers can suppress wages below the competitive equilibrium by restricting employment opportunities (Imani Bashokob et al., 2025). A substantial body of international literature posits that increased corporate concentration leads to deteriorating labour conditions, including lower wages, reduced bargaining power for workers, and increased job precarity (Clapp, 2024). This perspective is supported by evidence from various agri-food sectors, where consolidation has been linked to suppressed farmer incomes, precarious work, and heightened pressure on workers (Hendrickson et al., 2020; Clapp, 2021; Shi et al., 2010). Studies in Central and Eastern European contexts have documented similar concerns, where post-transition economic concentration often coincided with labour market flexibilisation and weakened union influence (Bakucs et al., 2009).

However, alternative theoretical perspectives suggest that, under certain conditions, market concentration may be associated with improved compensation

outcomes. Efficiency wage theories argue that firms may deliberately pay wages above the market-clearing level to attract higher-quality workers, reduce turnover, and enhance productivity (Katz, 1986). Furthermore, in contexts with strong institutional frameworks such as sectoral collective bargaining, stringent minimum wage laws, or effective regulatory oversight the negative effects of monopsony power may be mitigated. In such environments, workers may capture a share of the economic rents generated by concentrated, high-profit firms (Johnston *et al.*, 2024). Additionally, concentrated firms might face greater public and regulatory scrutiny, leading them to adopt better labour practices to mitigate reputational risks or comply with stricter standards often associated with larger, especially foreign-owned, enterprises (Clapp, 2024; Imani Bashokoh & Korani, 2024).

The Hungarian context presents a unique setting to test these competing hypotheses. Research on the Hungarian food industry has documented high levels of concentration and market power, particularly in sectors like dairy and meat processing (Bakucs *et al.*, 2009; Perekhobuk *et al.*, 2013). Yet, the specific impact of this concentration on labour conditions within the cereal industry remains underexplored. Hungary's post-socialist transition, significant foreign direct investment (FDI), and evolving labour market institutions create a complex environment where the conventional monopsony model may not fully apply. This study aims to fill this gap by empirically analysing the association between corporate concentration and a range of labour condition variables in Hungary's cereal industry from 2003 to 2022. It contributes to the broader debate on market structure and labour outcomes in transitional economies by examining whether the Hungarian case aligns more with efficiency wage and institutional mitigation theories or with traditional monopsony power predictions.

Labour Implications of Corporate Concentration

Building on this framework, the consolidation of corporate concentration in the food industry can have profound but ambiguous consequences for labour conditions. While monopsony theory predicts adverse effects, the alternative mechanisms discussed above suggest potential for improved compensation in specific contexts. Workers may face declining wages, precarious employment, and unsafe working environments, particularly among vulnerable groups like migrant labourers (Hendrickson *et al.*, 2020; Shi *et al.*, 2010). Conversely, in segments dominated by efficient, high-value, or regulated firms, increased concentration might be associated with better pay and formal working hours, though not necessarily with broader employment conditions such as job security or work-life balance (Clapp & Isakson, 2018; Greenberg, 2017). Farmers encounter reduced autonomy, restricted market access, and suppressed earnings due to the monopolistic influence of large agribusinesses. Consumers, in turn, may experience higher prices and limited product variety (Torshizi & Clapp, 2021).

Hungary's food industry is a cornerstone of economic stability, yet its increasing corporate concentration raises critical questions about labour conditions. The research aims to analyse how corporate concentration influences seven key labour-related variables: 1. Gross monthly earnings, 2. Monthly wages, 3. Overtime hours,

4. Base hourly wages, 5. Full-time blue-collar employment levels, 6. Paid holidays, 7. Employee age distribution.

By assessing these variables against the backdrop of competing theoretical explanations, the study seeks to provide empirical insights into how corporate concentration affects wage distribution, employment structures, and overall labour rights within Hungary's cereal industry, thereby clarifying the mechanisms at play in a concentrated, post-transition economy.

MATERIALS AND METHODS - DATA COLLECTION AND CATEGORIZATION

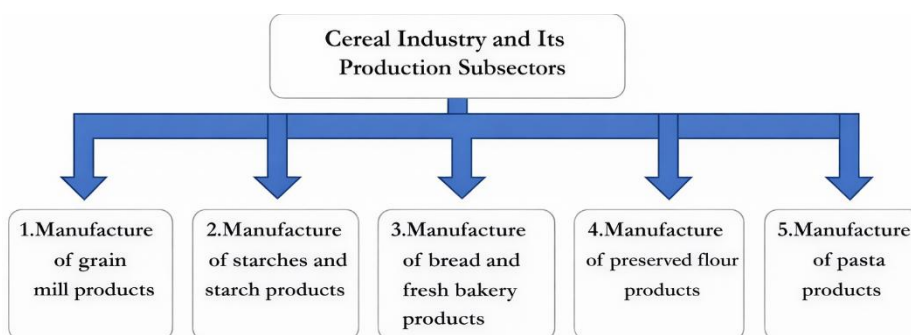
Study Scope and Industry Definition

This study examines the Hungarian cereal processing industry, operationally defined as all post-harvest manufacturing activities that transform primary cereal grains into intermediate or final products. The industry scope is delineated using the Hungarian NACE (*TEÁOR'08*) classification system, encompassing five four-digit subsectors:

- 10.61: Manufacture of grain mill products
- 10.62: Manufacture of starches and starch products
- 10.71: Manufacture of bread and fresh bakery products
- 10.73: Manufacture of preserved flour products
- 10.85: Manufacture of pasta products

The primary cereal inputs include wheat (*Triticum spp.*), maize (*Zea mays*), barley (*Hordeum vulgare*), and rye (*Secale cereale*), constituting over 95% of raw material inputs. Detailed sector categorization and production outputs are depicted in *Figure 1*.

Figure 1: Sub-sectors of the cereal industry and its productions in Hungary



Data Sources and Collection Framework

A comprehensive longitudinal dataset spanning 2003-2022 was constructed from three primary sources:

1. *Central European University (CEU) Database*: Firm-level financial and market structure data

2. *KRTK Databank and HUN-REN (Hungarian Research Network) Database*: Detailed labour market statistics
3. *STATISTA Platform*: Aggregate sectoral data and contextual economic indicators

This study integrates data from multiple sources to construct a comprehensive longitudinal dataset covering the period 2003–2022. *Table 1* summarizes the key data categories, the specific variables derived from each source, the collection frequency, and the primary identifiers used for integration.

Table 1: Data Sources and Variable Mapping

Variable Category	Specific Variables	Primary Source	Collection Frequency	Key Identifier
Market Structure	Firm revenue, Market shares	CEU Database	Annual	Tax ID, Company Name
Labour Conditions	Wages, Employment, Demographics	KRTK Databank and HUN-REN	Annual	NACE 4-digit code
Sectoral Context	Production volumes, Price indices	STATISTA	Annual	HS/NACE codes
Control Variables	Inflation, Minimum wage, FDI	National Bank, Ministry	Annual	National aggregates

As shown in *Table 1*, the dataset was constructed by integrating multiple sources. Firm-level revenue and market share data came from the Central European University (CEU) Database, matched annually using Tax IDs and company names. Labour condition variables including wages, employment, and demographics were sourced from the KRTK Databank (HUN-REN Database) and organized by 4-digit NACE codes. Sectoral context data, such as production volumes and price indices, were obtained from STATISTA and aligned with HS/NACE classifications. Control variables, including inflation, minimum wage, and FDI inflows, were compiled from official Hungarian institutions (National Bank and Ministry of Finance). This multi-source approach ensured consistent annual observations and robust alignment across market, labour, sectoral, and macroeconomic dimensions for the period 2003–2022.

Cereal Production Data Composition

Table 2 summarizes the average annual production of key cereal types used as inputs in Hungary’s cereal processing industry over the study period (2003–2022). For each cereal, the table reports the mean production volume (in metric tons) along with its standard deviation, the primary data source, the main NACE subsectors where it is processed, and its estimated proportion within the industry’s total raw material input.

Table 2: Annual Cereal Production in Hungary (2003-2022 Average)

Cereal Type	Average Production (tons)	Primary Source	Primary Processing Subsectors	% of Input
Wheat	4,850,000 ± 550,000	HUN-REN	10.61, 10.71, 10.85	42%
Maize	6,350,000 ± 720,000	CEU	10.62, 10.73	38%
Barley	920,000 ± 110,000	HCSO	10.61, 10.73	12%
Rye	165,000 ± 25,000	HUN-REN	10.61, 10.71	5%
Other	215,000 ± 45,000	Multiple	Various	3%

As shown in *Table 2*, wheat and maize dominate the input mix, together accounting for 80% of total cereal inputs. Wheat is primarily processed into milling products, bread, and pasta (NACE codes 10.61, 10.71, 10.85), while maize is mainly used in starch and preserved flour production (10.62, 10.73). Barley and rye represent smaller shares, and “Other” cereals collectively contribute 3% of inputs. The data reflect both the scale of Hungarian cereal production and its allocation across processing subsectors, highlighting the material basis for the industry analysis.

Variable Construction and Measurement

Corporate Concentration Measurement

The Herfindahl-Hirschman Index (HHI) (1) serves as the primary measure of corporate concentration (*Hirschman*, 1945; *Herfindahl*, 1963). For each subsector j in year t , HHI is calculated as:

$$HHI_{jt} = \sum_{i=1}^{n_{jt}} \left(\frac{R_{ijt}}{R_{jt}} \times 100 \right)^2 \quad (1)$$

Where:

- R_{ijt} = revenue of firm i in subsector j , year t
- R_{jt} = total revenue of subsector j , year t
- n_{jt} = number of firms in subsector j , year t

Key Implementation Details:

- Market boundaries defined at 4-digit NACE level
- Includes firms with annual revenue >50 million HUF (covers ~92% of sector revenue)
- Market shares based on domestic production revenue
- Missing data (<3%) imputed using moving averages

Labour Condition Variables

Seven labour variables were constructed with precise definitions and measurement protocols. The comprehensive framework is illustrated in *Figure 2*.

Figure 2: Labour Conditions Variables Framework

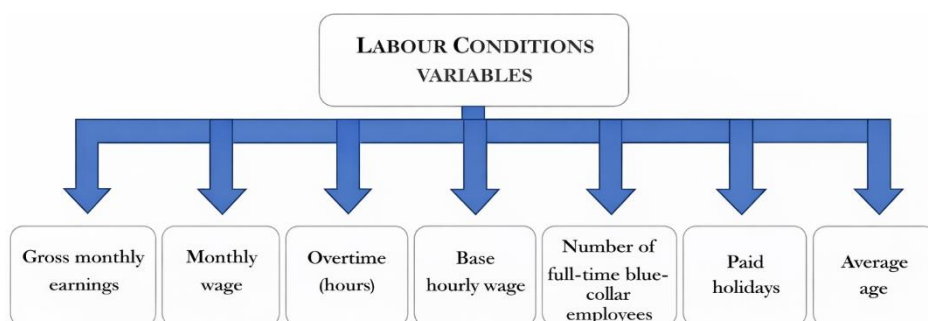


Table 3 provides the operational definitions, construction methods, units, and analytical relevance for the seven key labour condition variables examined in this study. Each variable was carefully defined and constructed to ensure consistency and comparability across the 20-year dataset.

Table 3: Labour Variable Definitions and Construction

Variable	Definition	Construction	Unit	Relevance
Gross Monthly Earnings	Total pre-tax monthly remuneration	Base + Overtime + Bonuses + Allowances	HUF	Total compensation
Monthly Wage	Base monthly salary excluding overtime	Directly reported base component	HUF	Standardised compensation
Base Hourly Wage	Standard hourly rate	Monthly Wage ÷ 173.33 hours	HUF/hour	Cross-schedule comparison
Overtime Hours	Hours beyond 40-hour week	Direct firm reports	Hours	Work intensity indicator
Full-Time Blue-Collar Employees	Production workers (≥36 hrs/week)	Count of manual workers	Count	Employment stability
Paid Holidays	Annual paid leave entitlement	Statutory + supplementary	Days	Job quality proxy
Average Age	Mean age of production workers	$\frac{\sum \text{Age}}{N}$	Years	Workforce demographics

As shown in *Table 3* the variables are categorised into three conceptual groups: compensation measures (Gross Monthly Earnings, Monthly Wage, Base Hourly Wage), work intensity and stability indicators (Overtime Hours, Full-Time Blue-Collar Employees), and job quality and demographic metrics (Paid Holidays, Average

Age). Each was constructed using transparent and replicable methods such as direct reporting, aggregation or standardized calculations to support reliable longitudinal and cross-sectional analysis. Together, these variables provide a multidimensional view of labour conditions within Hungary's cereal industry.

Data Integration and Descriptive Statistics

Integration followed a systematic protocol:

1. *Firm-level matching:* CEU and KRTK Databank (HUN-REN data) linked via Tax Identification Numbers
2. *Sectoral alignment:* Aggregation to 4-digit NACE codes using TEÁOR classification
3. *Temporal synchronization:* All data standardised to calendar year basis
4. *Monetary adjustment:* Values converted to constant 2020 HUF using CPI
5. The final dataset represents a balanced panel of 100 observations (5 subsectors $\times$ 20 years).

Analytical Framework

The analysis employs a two-stage approach to balance exploratory insight with causal rigor:

Stage 1: Exploratory Correlation Analysis

Initial bivariate Pearson correlations identified preliminary associations between HHI and labour variables using IBM SPSS 26. This informed subsequent model specification.

Stage 2: Panel Data Regression Analysis

To address confounding and enhance causal inference, we estimate two-way fixed effects models:

$$Y_{jt} = \beta_0 + \beta_1 \text{HHI}_{jt} + \gamma \mathbf{X}_{jt} + \alpha_j + \delta_t + \epsilon_{jt} \quad (2)$$

Where:

- Y_{jt} = labour outcome for subsector j , year t
- HHI_{jt} = concentration measure
- $\mathbf{X}_{jt}$ = vector of control variables
- α_j = subsector fixed effects
- δ_t = year fixed effects

Control Variables

The control vector $\mathbf{X}_{jt}$ includes:

1. Annual inflation rate (Hungarian CPI)
2. National minimum wage level
3. FDI inflows to food sector
4. Working-age population growth rate (25-64)
5. Cereal price index
6. Sectoral union density rate

Model Diagnostics and Estimation

1. *Specification tests*: Hausman test supported fixed effects ($p < 0.01$)
2. *Error structure*: Cluster-robust standard errors address autocorrelation and heteroskedasticity
3. *Multicollinearity*: All VIFs < 4 , indicating no severe issues
4. *Estimation*: Stata 18 with xtreg command, cluster-robust SEs
5. *Significance*: 5% threshold ($p < 0.05$)

Methodological Limitations and Robustness

Acknowledged Limitations

1. *Causality*: Fixed effects reduce but cannot eliminate endogeneity concerns
2. *Aggregation*: Subsector-level analysis may mask firm heterogeneity
3. *Measurement*: Revenue-based HHI may not capture input market power
4. *Coverage*: Small firms ($< 50\text{M HUF}$) underrepresented ($\sim 8\%$ of market)

Robustness Checks

1. Alternative concentration measures (CR4)
 2. Subsample analyses (pre/post-2008)
 3. Different model specifications
 4. Outlier treatment (winsorisation)
 5. Lagged HHI specifications
- All checks supported main findings' stability.

RESULTS AND DISCUSSION

This section investigates the influence of corporate concentration on key labour-related variables within Hungary's cereal industry. Corporate concentration, measured as the independent variable, is analysed in relation to seven dependent variables implemented above: gross monthly earnings, base hourly wages, overtime hours, full-time blue-collar employment levels, monthly wages, paid holidays, and employee age distribution.

Descriptive Overview

Table 4 presents the summary statistics for all key variables used in the empirical analysis, based on the balanced panel dataset spanning 2003–2022 ($N = 100$ observations: 5 subsectors $\times$ 20 years). For each variable, the mean, standard deviation (SD), minimum (Min), maximum (Max), and total number of observations (N) are reported.

To ensure clarity, each variable is precisely defined below. A critical distinction is made between compensation components:

As shown in Table 4, the descriptive statistics reveal meaningful patterns. The wide range of HHI (670.7 to 5,440.8) confirms substantial variation in market structures across subsectors and time, providing the necessary variation to test its effects. The logical gap between the means of Gross Monthly Earnings (321,450 HUF) and

Monthly Wage (281,230 HUF) validates the variable construction, with the difference (~40,220 HUF) representing overtime, bonuses, and allowances. The higher variability in Overtime Hours and Full-Time Employees suggests these conditions are more responsive to market and operational changes. In contrast, the stability of Paid Holidays and Average Age implies these aspects are shaped by slower-changing institutional norms and demographic factors.

Table 4: Descriptive Statistics (2003-2022)

Variable	Mean	SD	Min	Max	N
HHI	1,872.4	896.7	670.7	5,440.8	100
Gross Monthly Earnings	321,450	44,820	245,120	410,340	100
Monthly Wage	281,230	39,450	220,450	360,120	100
Base Hourly Wage	1,762	238	1,380	2,248	100
Overtime Hours	12.6	4.9	5.2	25.1	100
Full-Time Employees	1,245	382	652	2,098	100
Paid Holidays	22.6	3.3	20.0	28.0	100
Average Age	42.4	2.2	38.1	47.3	100

These preliminary patterns suggest that corporate concentration may have a more pronounced and variable association with direct compensation and work intensity metrics than with institutionalised benefits or demographic composition, setting the stage for the multivariate analysis that follows.

Twenty Years of Changes in the Hungarian Cereal Industry

Over the period 2003–2022, Hungary’s cereal industry has experienced gradual but uneven changes in corporate concentration, as evidenced by the combined interpretation of *Table 5* and *Figure 3*. While the overall industry trend points toward increasing concentration, this development has been highly subsector-specific, reflecting differing structural and competitive dynamics within the industry.

The milling industry and the manufacture of bread and fresh bakery products consistently exhibit low HHI values (below 1500) throughout the 20-year period, indicating unconcentrated and competitive market structures. These subsectors show limited signs of consolidation, suggesting relatively low entry barriers and sustained participation by multiple firms.

In contrast, the production of starch and starch products remains persistently highly concentrated, with HHI values well above the 2500 threshold, indicating strong market dominance by a small number of firms. Pasta production follows a similar trajectory, displaying high concentration levels across most periods, though with some fluctuations. These two subsectors are the primary drivers of the overall increase in corporate concentration observed at the industry level.

The production of preserved flour products represents an intermediate case, transitioning into a moderately concentrated market structure (HHI between 1500 and 2500) over time. This gradual increase in concentration signals ongoing consolidation and a shift away from fully competitive conditions.

Overall, the evidence shows that changes in corporate concentration within Hungary's cereal industry over the past two decades have not been uniform. Instead, rising concentration has been driven mainly by capital-intensive subsectors, while traditional milling and bakery activities have retained more competitive structures. This structural divergence is critical for understanding subsequent labour-market outcomes, as the economic and employment effects of concentration are likely concentrated within specific subsectors rather than across the entire industry.

Table 5: Overall 20-year Trend of Corporate Concentration

HHI for subsectors of the cereal industry	Milling industry product production	Production of starch and starch products	Bread and manufacture of fresh bakery products	Production of preserved flour products	Pasta production
2003-2007	1500>1319	2500<9349/5	1500>1108/8	1500<2222/1<2500	2500<5194/3
2008-2012	1500>669/5	2500<9893/7	1500>1031/9	1500<1615/7<2500	1500<1836/1<2500
2013-2017	1500>670/7	2500<9688/7	1500>1112/8	1500>1370/3	1500<2270/4<2500
2018-2022	1500>843/3	2500<5441	1500>1247/2	1500>1476/6	1500<2095/7<2500
Total Corporate Concentration	1500>875/63 Unconcentrated Markets	2500<8593/23 Highly Concentrated Markets	1500>1127 Unconcentrated Markets	1500<1670/75<2500 Moderately Concentrated Markets	2500<2848/75 Highly Concentrated Markets

Figure 3: Twenty years of changes in the Hungarian cereal industry



Specifications of Key Labour-Related Variables and Empirical Results

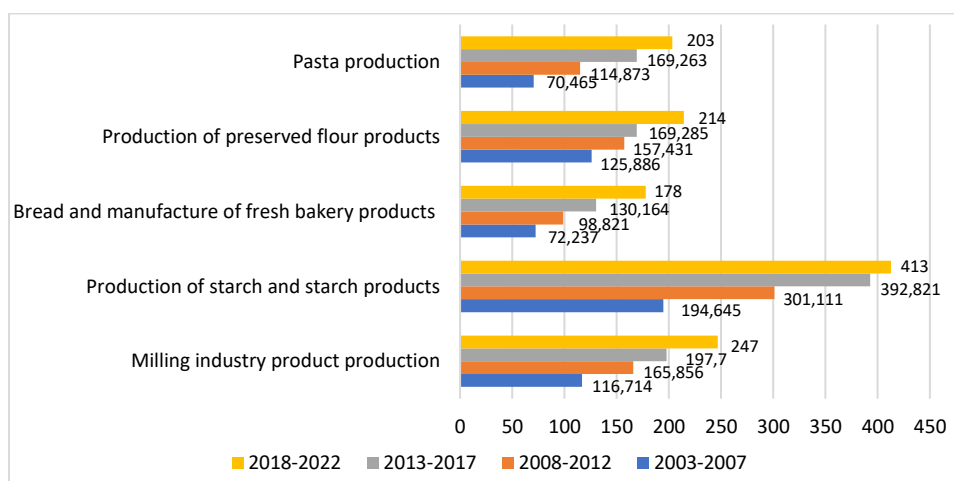
Figures 4–10. and the corresponding regression Tables (6–11) jointly illustrate the relationship between corporate concentration measured by the Herfindahl–Hirschman Index (HHI) and key labour-related outcomes in Hungary's cereal industry from 2003 to 2022. Each subsection below introduces the labour variable, followed by an integrated interpretation of its graphical trend and econometric results.

Monthly Wage (Base Monthly Salary)

In this study, monthly wage is defined as the base salary earned by workers, excluding overtime payments but including standardised wage components. It serves as a key indicator of wage levels within Hungary's cereal industry.

As shown in *Figure 4* monthly wages exhibit a clear upward trend as corporate concentration, measured by the Herfindahl–Hirschman Index (HHI), increases. The figure indicates that workers employed in more concentrated subsectors tend to receive higher base monthly pay, suggesting a positive association between market concentration and wage levels.

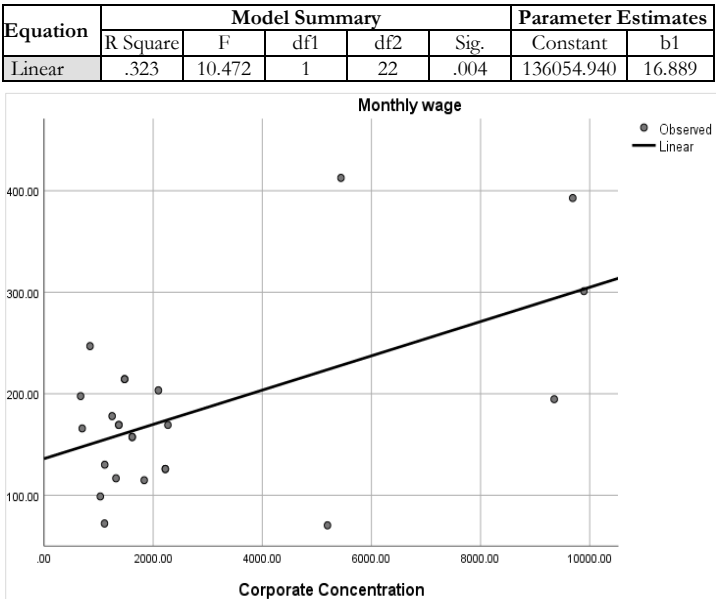
Figure 4: Monthly Wage Based on HUF



The visual pattern is statistically confirmed by the regression results presented in *Table 6*. Our analysis shows a statistically significant positive relationship between corporate concentration and monthly wages ($p = 0.004$). The positive coefficient indicates that increases in HHI are systematically associated with higher monthly wages, while the model explains a meaningful proportion of the variation in wage levels ($R^2 = 0.323$). Moreover, the graphical representation of the data demonstrates a positive correlation, suggesting that the increasing corporate concentration in Hungary's cereal industry in recent years has been accompanied by a rise in monthly wages (*Clapp, 2024*). This finding reinforces the statistical significance of the observed relationship and highlights the potential impact of corporate concentration on wage dynamics within the sector.

Therefore, the results from *Figure 4* and *Table 6* demonstrate that rising corporate concentration in Hungary's cereal industry is associated with higher base monthly wages. This finding suggests that dominant firms may possess greater financial capacity or productivity advantages that allow them to offer higher standardised wages. Rather than depressing wages, increased concentration in this context appears to enhance base pay, indicating that workers may share in the economic gains generated within more concentrated market structures.

Table 6: Monthly Wage



Overtime Based on Hours

Overtime hours are employed in this study as a proxy for work pressure and labour intensity, reflecting their documented effects on workers’ health, fatigue, and job satisfaction (Burch & Lawrence, 2013). Analysing overtime therefore provides important insight into whether increasing corporate concentration affects not only workers’ earnings but also their workload.

As shown in *Figure 5* overtime hours exhibit a positive upward trend as corporate concentration, measured by the Herfindahl–Hirschman Index (HHI), increases. The figure indicates that workers in more concentrated subsectors of Hungary’s cereal industry are more likely to work additional hours beyond the standard workweek, suggesting heightened labour intensity in these market structures.

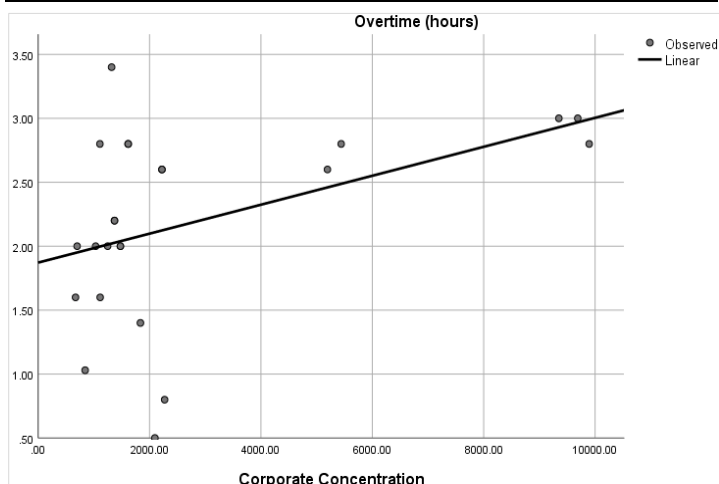
Figure 5: Overtime Based on Hours



This visual relationship is statistically confirmed by the regression results reported in Table 7. The analysis reveals a statistically significant positive association between corporate concentration and overtime hours ($p = 0.032$). The positive coefficient demonstrates that higher levels of market concentration are systematically linked to increased overtime, while the model explains a meaningful proportion of variation in overtime work ($R^2 = 0.193$).

Table 7: Overtime (hours)

Equation	Model Summary					Parameter Estimates	
	R Square	F	df1	df2	Sig.	Constant	b1
Linear	.193	5.260	1	22	.032	1.872	.000



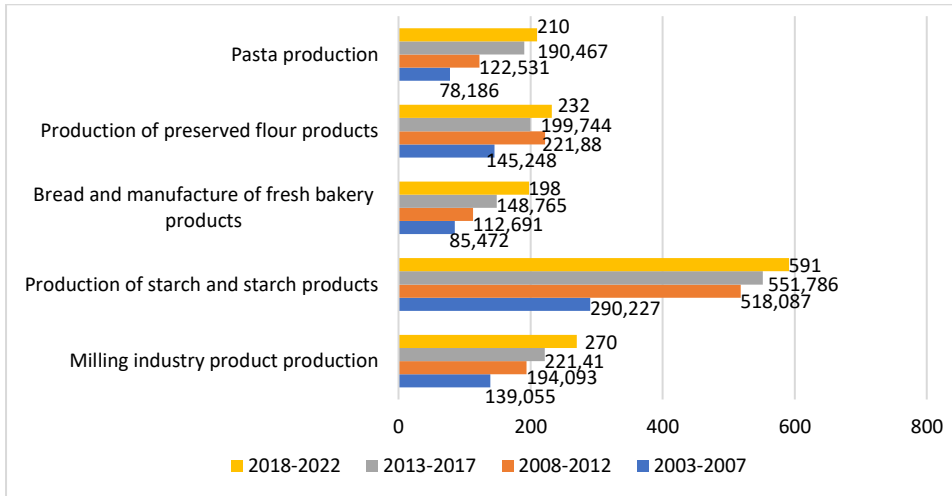
The results from Figure 5 and Table 7 indicate that rising corporate concentration is associated with increased work intensity. Although additional overtime may contribute to higher overall earnings, it also points to a potential deterioration in working conditions. Consistent with concerns raised by *Burch and Lawrence* (2013), the findings suggest that the financial gains linked to corporate concentration may be accompanied by longer working hours and increased strain on workers within Hungary's cereal industry.

Gross Monthly Earnings

Gross monthly earnings capture total financial remuneration, including base wages, overtime pay, bonuses, and allowances, and therefore represent a comprehensive indicator of workers' living standards and overall economic well-being.

As shown in Figure 6, gross monthly earnings increase steadily with rising corporate concentration, measured by the Herfindahl–Hirschman Index (HHI). The figure reveals a clear positive trend, indicating that workers employed in more concentrated subsectors of Hungary's cereal industry tend to receive higher total monthly compensation.

Figure 6: Gross Monthly Earnings Based on HUF



This visual relationship is strongly supported by the regression results presented in *Table 8*. Our analysis finds a highly statistically significant positive association between corporate concentration and gross monthly earnings ($p < 0.001$). The positive coefficient indicates that increases in market concentration are systematically associated with higher total earnings, while the model explains a substantial proportion of the variation in gross monthly pay ($R^2 = 0.494$).

Table 8: Gross Monthly Earnings

Equation	Model Summary					Parameter Estimates	
	R Square	F	df1	df2	Sig.	Constant	b1
Linear	.494	21.474	1	22	.000	137323.215	33.118



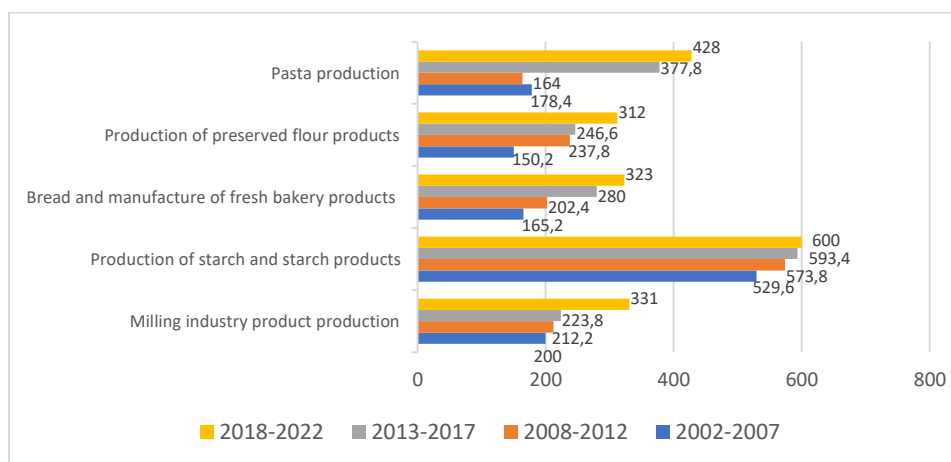
Taken together, the results from *Figure 6* and *Table 8* demonstrate that rising corporate concentration in Hungary's cereal industry is associated with improved overall compensation. This finding is consistent with arguments from efficiency wage theory and rent-sharing mechanisms, which suggest that firms with greater market power and higher profitability may share rents with workers through higher total earnings (*Clapp, 2024*). However, when interpreted alongside the results on overtime, the increase in gross earnings may partly reflect longer working hours, indicating that higher compensation in concentrated markets may be accompanied by increased labour intensity.

Base Hourly Wage Based on HUF

The base hourly wage represents the fundamental hourly compensation paid to employees, excluding overtime, bonuses, or allowances. It serves as a standardised metric that facilitates comparison of wage levels across different sectors and working schedules, providing insights into wage structures within the industry.

Figure 7, illustrates the relationship between corporate concentration, measured using the Herfindahl–Hirschman Index (HHI), and base hourly wages in Hungary's cereal industry. The figure reveals a steady upward trend, indicating that higher levels of market concentration are associated with increased base hourly wages. This observation is corroborated by regression analysis, which demonstrates a strong and statistically significant positive association ($p < 0.001$) between HHI and base hourly wages.

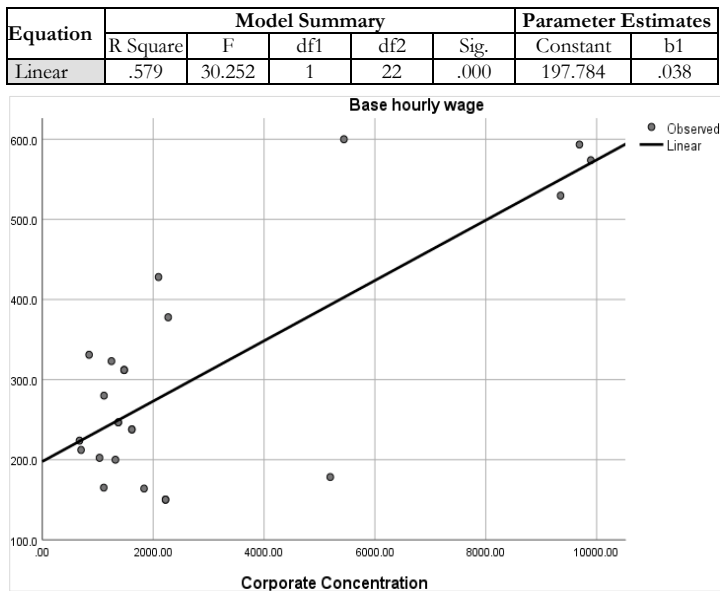
Figure 7: Base Hourly Wage Based on HUF



The regression results indicate a p-value of 0, which is well below the conventional significance threshold of 0.05, confirming a statistically significant relationship between corporate concentration and base hourly wages as shown in *Table 9*. The positive coefficient further suggests that increases in market concentration are systematically associated with higher standardised hourly wages.

These findings imply that more concentrated subsectors in Hungary’s cereal industry may exert upward pressure on base wage rates. Potential explanations include higher profitability of dominant firms, enhanced regulatory oversight, or stronger collective bargaining structures prevalent in larger enterprises. Overall, both the graphical and statistical analyses indicate that rising corporate concentration has coincided with an increase in base hourly compensation in the sector (*Clapp & Isakson, 2018*).

Table 9: Base Hourly Wage



Paid Holidays Based on the Day of a Year

Paid holidays, or annual leave entitlement, are a key indicator of job quality, work–life balance, and overall employee well-being. Analysing paid holidays in relation to corporate concentration can provide insights into how labour benefits beyond direct wages are influenced by market structure.

Figure 8, depicts the relationship between corporate concentration, measured by the Herfindahl–Hirschman Index (HHI), and the number of paid holidays employees receive annually. The figure suggests a slight upward trend in leave entitlements as market concentration increases. However, this relationship appears relatively weak.

The regression results indicate a p-value of 0.446, which exceeds the conventional significance threshold of 0.05 as shown in *Table 10*. This confirms that the relationship between corporate concentration and paid holidays in Hungary’s cereal industry is not statistically significant. While the graphical representation shows a modest positive correlation, suggesting that paid leave has slightly increased alongside firm concentration, the effect is not robust enough to draw definitive conclusions (*Clapp & Isakson, 2018*).

Figure 8: Paid Holidays per Year

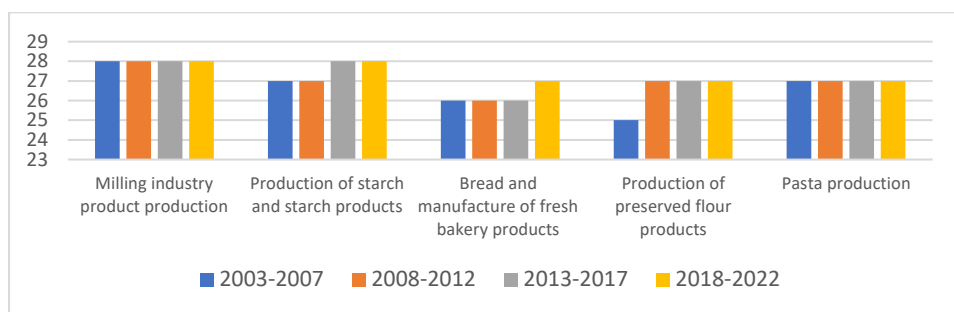
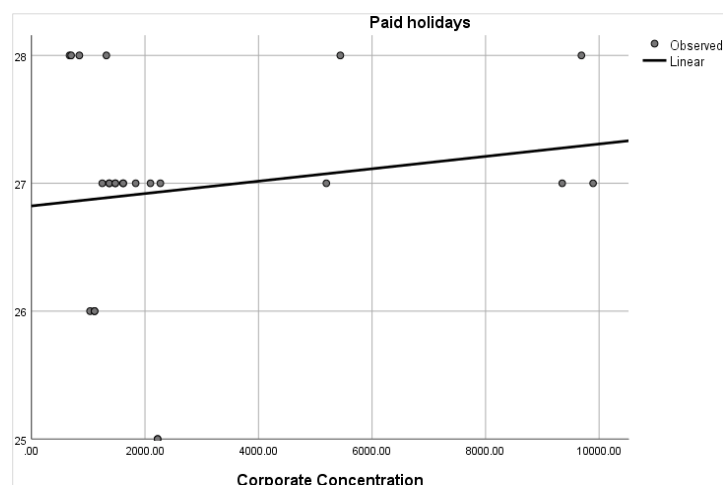


Table 10: Paid Holidays

Equation	Model Summary					Parameter Estimates	
	R Square	F	df1	df2	Sig.	Constant	b1
Linear	.027	.602	1	22	.446	26.823	4.845E-5



Overall, these findings imply that while wage-related benefits, such as gross earnings and hourly wages, tend to rise with corporate concentration, non-wage benefits like paid holidays are largely governed by statutory regulations and institutional frameworks rather than market structure.

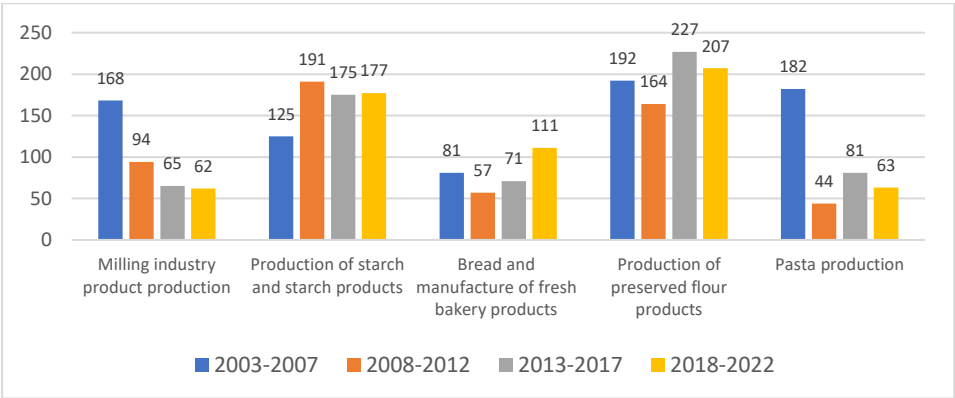
Number of Employees on Full-Time Blue-Collar Positions

Full-time blue-collar employment serves as an important indicator of job stability and labour absorption capacity within a sector. Examining trends in such employment relative to corporate concentration provides insights into whether industry consolidation affects workforce size.

Figure 9, illustrates the relationship between corporate concentration, measured via the Herfindahl–Hirschman Index (HHI), and the number of full-time blue-collar

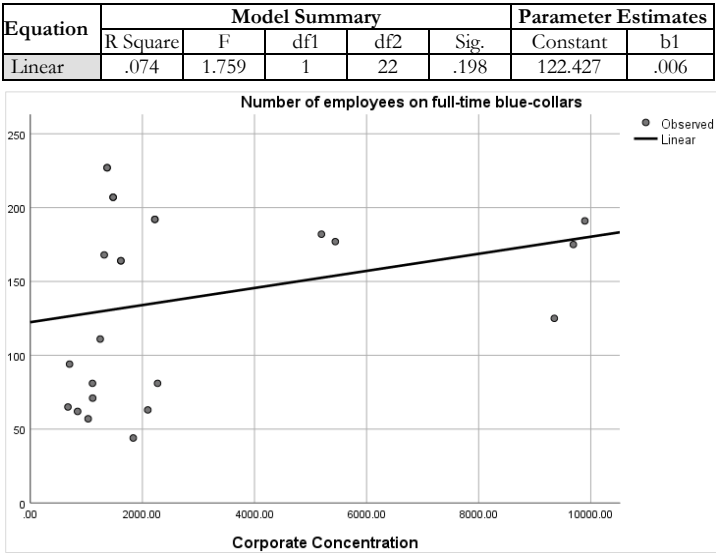
employees in Hungary’s cereal industry. The figure suggests a modest upward trend, indicating that employment levels slightly increase as concentration rises.

Figure 9: Number of Full-Time Blue-Collar Employees



The regression analysis shows a p-value of 0.198, which exceeds the conventional significance threshold of 0.05, indicating that the association between corporate concentration and full-time blue-collar employment is not statistically significant as shown in *Table 11*. While the graphical analysis reveals a slight positive correlation, suggesting that the number of full-time blue-collar workers has increased alongside concentration in recent years, this relationship lacks robust statistical support (*Clapp, 2024*).

Table 11: Number of Full-Time Blue-Collar Employees



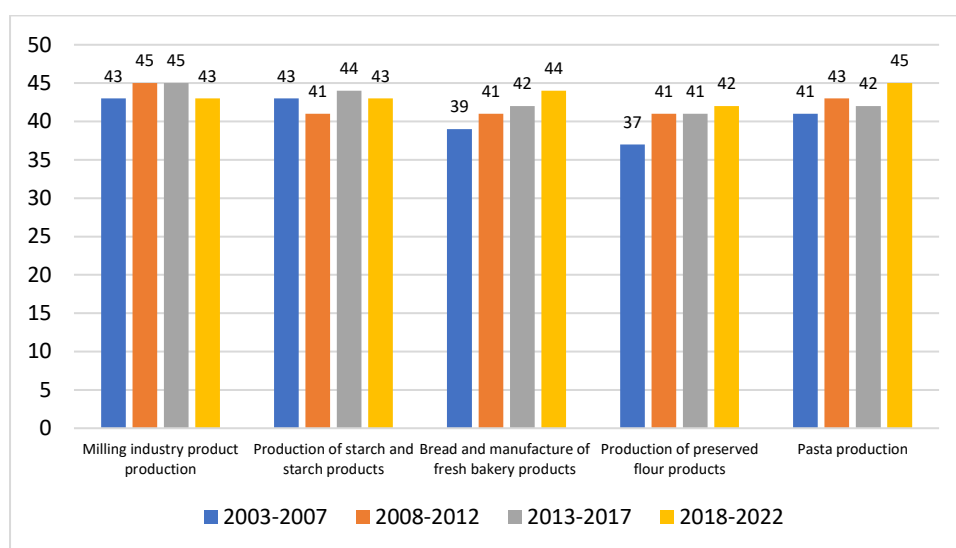
These findings imply that consolidation within Hungary's cereal industry may improve compensation and wage structures without necessarily expanding or reducing the workforce. In other words, higher market concentration appears to influence the quality of employment more than the quantity.

Average Age of Labourers

The average age of employees provides insights into workforce demographics, long-term employment patterns, labour retention, and the sector's attractiveness to younger workers. Understanding how corporate concentration affects workforce age can reveal whether consolidation influences the composition of the labour force.

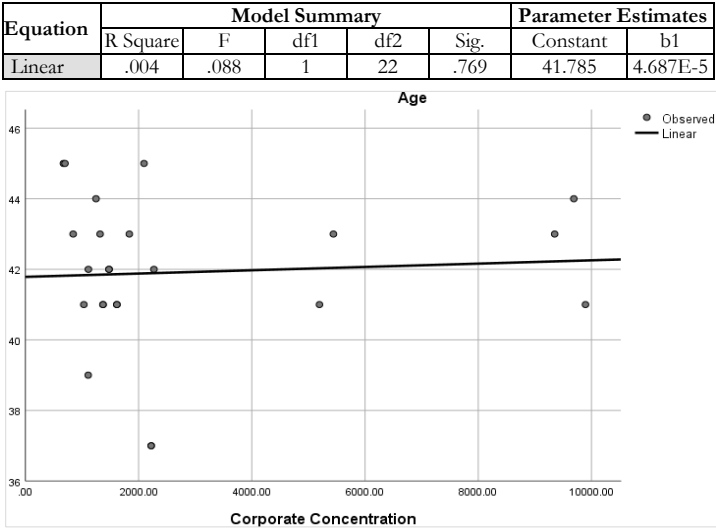
Figure 10, depicts the relationship between corporate concentration, measured using the Herfindahl–Hirschman Index (HHI), and the average age of workers in Hungary's cereal industry. The figure shows a slight upward trend in average age as concentration increases.

Figure 10: Average Age of Labourers



The regression results in Table 12 indicate a p-value of 0.769, which is well above the conventional significance threshold of 0.05. This confirms that there is no statistically significant relationship between corporate concentration and the average age of the workforce. While the graphical representation shows a modest positive correlation, suggesting that average age has slightly increased alongside market concentration, the effect is neither strong nor statistically robust. The moderate slope of the trend further supports the conclusion that workforce age is largely unaffected by industry concentration and is more likely influenced by broader demographic and labour market factors (Clapp, 2021; Clark, 2022; Greenberg, 2017).

Table 12: Age



Overall, these findings suggest that consolidation within Hungary’s cereal industry affects compensation more than workforce composition, with employee demographics remaining relatively stable despite rising concentration.

CONCLUSION

This paper has examined how corporate concentration and labour conditions in the Hungarian cereal processing industry were interconnected in the years 2003 to 2022. The results show that although market concentration increased in most subsectors, the effects of concentration on labour conditions were selective; financial compensation was significantly enhanced, but broader employment conditions remained largely unchanged. Namely, the gross monthly earning, base hourly wages, and overtime payments were positively associated with concentration, but there was no notable reaction to paid holidays, the size of the workforce, and average age of the worker, respectively. This trend indicates that increased market dominance in Hungary is associated with improved financial performance among the workers but does not have a significant impact on the job quality or labour force demographics.

Hungary appears to diverge from the classic monopsony prediction observed in many other markets. This dissimilarity could be attributed to a variety of situational forces:

- i. Role of Foreign Direct Investment (FDI): Hungary’s post-transition privatization is evidenced by many focused firms, which are foreign-owned. In many cases, these companies can implement efficiency wage models to attract, retain high-quality labour, minimize turnover, and become more productive, and in fact distribute economic rent with workers.

- ii. Institutional and labour policies: Hungary has labour market policies influenced by the statutory minimum wage that rose significantly over the period in study and collective bargaining within the food processing industries that are considered important. These are mechanisms that limit a possible wage-depressing concentration.
- iii. Sectoral and work intensity dynamics: The increase in wage with concentration is accompanied by a positive relationship with overtime, which suggests that increment in compensation could be coupled with work intensity, and it is a trade-off between employment gains and work-life balance.

Policy Implications

The results indicate a number of policy responses to these circumstances in order to make the gains of concentration broad-based and sustainable:

- i. Improved labour surveillance: During the merger review, the labour results and market concentration need to be evaluated by the authorities, including wages and work intensity (e.g., Hungarian Competition Authority).
- ii. Empowering work-life protection: Introduce overtime restrictions and more stringent laws to enforce work-life balance, so that the interests of financial profit will not be at the expense of the employees.
- iii. SMEs: With the assistance of SMEs, the market should not become monopolised by large companies but, by providing these small and medium manufacturers with access to money, adoption of modern technologies, and the joint promotion of their products, it is possible to maintain the diversity of the market without compromising the quality of labour.
- iv. Responsible FDI promotion: Foreign investment incentives should be tied to the use of high-road labour practices so that large, and frequent foreign owned enterprises can have a positive influence on wages, skill development, and sustainable employment terms.
- v. Utilizing wage subsidy programmes: An example of such policies used in Hungary is the use of wage subsidy programmes, which can be effectively applied to boost the effects of focusing on low-paid workers, so that all of the workforce can gain equally.

Future Research Suggestions

Future research would be employing causal mechanisms by longitudinal or instrumental variance design, study firm-level disparities between foreign and home-owned firms, and study broader well-being measures, including safety, turnover, and job contentment. Other Central and Eastern European countries could allow comparative studies to show whether Hungary may be a special case owing to post-transition FDI, institutional structures and sector unions.

To sum up, The Hungarian cereal industry demonstrates that corporate concentration can coexist with higher wages under specific institutional and ownership conditions. Nonetheless, policymakers should vigorously make sure that

these benefits are balanced with safeguards against job quality, work-life balance and labour market sustainability in the long run.

ACKNOWLEDGEMENT

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EXAMINATION OF THE KEY COMPETENCES OF MOTHERS WITH YOUNG CHILDREN IN ALIGNMENT WITH LABOUR MARKET NEEDS

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ABSTRACT

In the traditional family model, reconciling work and family life for women is a common challenge. National literature often identifies women as a disadvantaged group in the labour market, especially mothers with young children. Based on various psychological studies, mothers play a key role in ensuring the conditions for their children's healthy development during the childcare period. In addition, there is often financial pressure to return to work as soon as possible. In the public perception and also in the minds of mothers who look after their children at home, there is a perception of a decline in their abilities and a corresponding decline in their self-esteem. Our research aimed to highlight the repertoire of everyday activities that mothers perform in their daily lives, based on competences that can be transformed into labour-market skills. Our goal is to identify mothers' skills and explore how they view their own skills. We hope that our results will increase the self-esteem of the target group and change the attitudes of labour market actors towards them.

Keywords: disadvantage, key competences, female worker with young children, lack of self-confidence

JEL code: J24

INTRODUCTION

For several years, our research group has been monitoring the situation of mothers with young children from various perspectives. In this paper, we seek to answer the question of what mothers think about their own skills and how gaining insight into this can help employees with young children in their individual career paths.

In the first part of the study, we review the literature that we consider particularly important. One can learn about the disadvantaged position of women in the labour market and the concept of key competencies.

In the second part, within the framework of our own study, we examined how mothers' key competences change (skill development and atrophy) while staying at home with their babies. We present a type of interview called “motivational interview,” which has two benefits. On the one hand, exploring mothers' skills is useful for employers, and on the other hand, this interview method also develops mothers' positive self-image. Our goal is to identify mothers' skills and explore how

they view their own skills.–The article is based on document synthesis conducted according to predetermined criteria.

THEORY

Literature review

'Women's equality and women's employment ... are often, often voiced as a social and economic issue in the EU, but in the developed world the achievements are mostly a cause for concern' (Ternovszky, 2013, p. 36–44)

Europe was clearly defined by traditional female roles until the 19th century, according to which unpaid domestic work, such as family responsibilities, routine housework, and caretaking, was the responsibility of mothers. At the same time, fathers are responsible for the family's financial stability (Kőmiives *et al.*, 2023). In addition to the once-dominant breadwinner father role, the egalitarian model is becoming increasingly prominent today (Drjenovszky & Kézdy, 2023). The emergence of industrial society can be marked as a turning point in the employment of women. The social expansion of work and the major changes (feminisation, regime change, unemployment and globalisation later) have all had an impact on the position of women in the labour market, where they are disadvantaged according to most classifications (Horváth, 2012; Cserné *et al.* 2006; Halmos, 2005; Farkas *et al.*, 2007; Koncz, 2016). Kenderfi (2012) clearly states that disadvantaged persons are those whose social career opportunities are less secure than others' due to their living conditions and circumstances.

Nowadays, women still face significant disadvantages in the labour market (Horváth, 2012). Discrimination often occurs even in the job application process (Mészáros, 2006), as having children or the expected biological age to give birth can influence hiring decisions. Later in their career, women face several disadvantages related to horizontal and vertical segregation (Glass & Fodor, 2011; Mészáros, 2006). In the Hungarian financial sector, Glass and Fodor noted that motherhood has negative consequences (the “motherhood penalty”) that disadvantage women. In their survey, they identified three employer strategies: first, mothers are not considered suitable for work in a competitive financial environment; second, employers screen out mothers with young children and women planning to have children, steering them toward a career path promising fewer responsibilities and lower pay (the “mommy track”); finally, management views mothers of young children as lacking leadership ability, so these women are pushed out of the organization early on, resulting in stunted career advancement and wages, and the creation of a wage gap (Glass & Fodor, 2011).

A recent study analysed 52 articles published between 2010 and 2022 from 10 databases. On the one hand, it highlights the disadvantages of motherhood in the labour market. Despite women's progress in the workplace, mothers continually face systemic barriers that prevent them from advancing in their careers. On the other hand, it also identifies the positive aspects of the relationship between motherhood and career aspirations, which is consistent with our research findings, which generally

focused on the development of mothers' interpersonal and time management skills, as well as problem-solving skills (Calegari *et al.*, 2024).

Discrimination is a complex phenomenon that manifests in subtle and often hidden ways. Therefore, it cannot be explained by a few causes or easily identified. Kertesi defines discriminatory employer behaviour as 'differential treatment of workers with the same productivity' (Kertesi, 2001, as cited in Bencsik & Machová, 2014). However, some employers rarely consider mothers with young children to be valuable employees, instead viewing them as problematic (Primecz, 2015; Bencsik & Machová, 2014).

It is clear that women's participation in the labour market differs from men's in terms of economic participation, social differences, and traditions (Mészáros, 2006).

In Central and Eastern Europe (e.g., Hungary, Poland, Romania), childcare and education services have a long tradition and are generally available free of charge. Policies reflect traditional family roles and modern concepts of work-life balance (Agócs *et al.*, 2024).

They can stay at home with their baby for three years and receive extensive maternity benefits, or they can even return to the labour market, aided by a network of state nurseries and numerous financial incentives (Fűrész & Molnár, 2021). According to data from the Hungarian Central Statistical Office, the labour market participation of mothers with young children increased between 2012 and 2022, thereby creating demand for daytime childcare services. There is widespread support for the state's role in childcare (Medgyesi & Kopasz, 2024). The family support systems of neighbouring countries are similar to Hungary's in many respects (Michalski, 2024). The system of maternity leave related to childbirth and childcare, along with the associated cash benefits, in Hungary is extensive and quite complex, even by international standards (Gábos & Makay, 2023; Tomka & Gábos, 2024), particularly for employed women. It is encouraging that, compared to 2010, Hungary has seen the most significant increase in the desire to have children in the EU by 2021. The trend of having at least two children has been broken since 2022; hopefully, this is temporary, and the trend observed over the past decade, which has a positive effect on children's socialisation, will continue (Pári, 2024).

The majority of mothers with young children return to the labour market after their child turns 3 (Varga, 2019). Bálint and Köllő (2008) state that the average time from leaving the workplace to leaving the child support system is 4.7 years (Bálint & Köllő, 2008 in Bencsik & Juhász, 2014), which may be even longer for families with several children. The introduction of GYES (childcare benefit) in 1967 and GYED (childcare allowance) in 1986 was a significant milestone in post-childbirth benefits, enabling women to work while caring for their children. The success of the reintegration of mothers with young children depends to a large extent on the conditions under which this process takes place.

Key competences

Our key skills have a significant impact on our ability to manage in the labour market and to perform our activities effectively. Over the last half-century, a variety of definitions of non-occupational skills have been developed, such as skill cover and

non-occupational skills. In the 1950s, key competences were linked to personality characteristics as a condition for successful performance (*Super & Bohn, 1970*). Here, we would like to note that, in our study, we assign almost the same meaning to the concepts of competence, ability, and key competences, and consider them to be essentially necessary conditions for high-level performance. According to the most common approach, competence, knowledge, and attitude are interrelated. The word 'competence' has several meanings in the vernacular: competence, entitlement, expertise, and competency. It is most often understood as a unit of knowledge, skills and attitudes in the professional community. In this paper, we treat (key) competence and (key) ability as synonyms, although we recognise that no equivalence can be drawn between the two concepts. It is a fact that they facilitate filling in all jobs (*Bajusz, 2008*). The concept of key competences itself was introduced in the 1970s by a German work educator, *Mertens (1974)*. According to the EU recommendation, it is the ability of an individual to apply their knowledge, skills and qualifications in both standard and changing occupational contexts. According to *Szilágyi (2007)*, on the one hand, key competences are the foundation for successful performance (the ability to cooperate, build relationships, communicate, solve problems, and take responsibility). On the other hand, the Mertensian concept of key competences is a set of general, non-professional, mobilisable, and transferable skills, the existence of which is increasingly valued by employers.

The definition that we have adopted can be found in the glossary of the Career Counselling journal, where the following definition is given for key competences: The set of competences that, in addition to professional knowledge, fundamentally determine the employee's integration, motivation, manageability and creativity. It includes the human, social and emotional characteristics which, in addition to professional and intellectual ability, determine how an individual manages in a community and in a workplace (*Szilágyi, 2007*). In the world of work, autonomy and teamwork are mostly associated with modern work processes, which are interlinked and can be called 'system competences'. Alongside all this, there is also a socially based approach to key competences, which is the key to our survival. In this context, the ability to adapt is considered a 'constructive competency' for the development of society (*Szilágyi, 2007*). Taking into account the above theoretical framework, Hungarian researchers include the group of competences marked 3C, such as communication, conflict resolution and cooperation, in the scope of key competences. The majority of authors agree that problem-solving skills and the autonomy of thought and action are important determinants of success in the world of work. Another division of transversal skills or key competences, found on a professional portal (*Taninfo.hu, n.d.*), can be organised into three main categories: interdisciplinary, methodological, and personality traits. The importance of key competences extends beyond professions, but they are also well known in professions and overlap in many respects. Mobilising pre-existing occupational skills (e.g., drawing, welding practice, good manual dexterity) predicts success in employment (learning a new occupation) (*Szilágyi, 2007*). Key competences appear in job advertisements, and their prevalence has been studied by *Mertens (1974)*, *Siegrist (1993)* and, in Hungary, *Bajusz (2008)*, among others.

METHODOLOGY

The research questions in this study seek to determine what mothers think of their own skills and how this understanding can help working parents of young children; however, we also consider it important to present the results of our other studies, which cover competencies deemed important from a labour-market perspective. We recently collected, studied, and analysed surveys and forecasts from leading scientists in the field to gain an in-depth understanding of the areas of expertise that have been and will continue to be the focus of employer demand and near-term forecasts. The data used for the study comes from various reliable journals and articles. We critically studied and reviewed the data obtained. The result was produced by analysing secondary data, literature sources, and Hungarian and international databases.

In our research, the questionnaire and interview surveys were conducted with workers with children under 6 years old, employers, and mothers with young children still at home in some form of childcare (n=1510). The objective of the survey was to identify the basic characteristics of mothers with young children that could help them manage in the labour market, on the one hand, and to understand employers' attitudes, on the other hand. Mothers with a young child or children (under 6 years) and HR staff and relevant senior employees involved in the reintegration process were approached by HR staff and employers through the involvement of students of the master's programme in Human Resource Counselling at the Hungarian University of Agriculture and Life Sciences (former Szent István University). We prepared the students for these studies in advance, then compiled their results and experiences during a systematic analysis of their theses.

Our total sample size over the years was 1,510 individuals, which cannot be considered representative (e.g., it varied from year to year) and also exhibits heterogeneity in its parameters (e.g., age, education level, geographic location). However, the research target population consisted of mothers with young children who were working or wanted to work at the time of the study. The HR professionals, meanwhile, were specialists working in HR departments at various companies who were involved in their reintegration from the employer's side.

Data extraction and synthesis were performed, and relevant information was collected. Finally, the evidence was evaluated, and our results were described in this study after systematic grouping and weighting. We sought to determine employers' and employees' expectations and opportunities regarding young children during the reintegration process.

ANALYSIS

Our analysis summarises the experience of four studies:

- *Siegrist* (1996) analysed nearly seven hundred job advertisements and ranked them by frequency.
- *Komor* (2001), at the request of the Ministry of Education, carried out a survey of employee competences, of which the final study was prepared with the

involvement of the former Faculty of Economics and Social Sciences of Szent István University.

- Kucsák (2019) collected the skills required by domestic employers.
- Within the Framework for 21st Century Learning, the *Battelle for Kids* (BfK), 2019 document has organised the skills needed for successful graduates into 4K models.

In *Table 1*, in addition to the four surveys above, forecasts are also displayed. In 2016, *Zahidi & Till*, referring to the *World Economic Forum* (WEF), 2016 report (*The Future of Jobs*), published the 10 most important skills for work in 2015 and predicted them for 2020. In 2015, 2020, and 2025, the WEF produced projections of the 10 skills that employers will expect in the future.

Table 1: Areas most frequently found in the research analysed

Type of Survey Competences	Employer needs assessments				World Economic Forum forecasts			Occur- rence (items)
	1996 Siegrist	2001 Komor	2019 Kucsák	2019 BfK	2015	2020	2025	
problem solving	x	x	x	x	x	x	x	7
communication	x	x		x	x	x	x	6
cooperation	x	x	x	x	x	x		6
taking responsibility	x			x	x	x	x	5
creativity			x	x	x	x	x	5
flexibility			x	x		x	x	4
critical thinking				x	x	x	x	4
learning	x	x					x	3
technological skills			x	x			x	3
emotional intelligence			x			x		2
service orientation					x	x		2

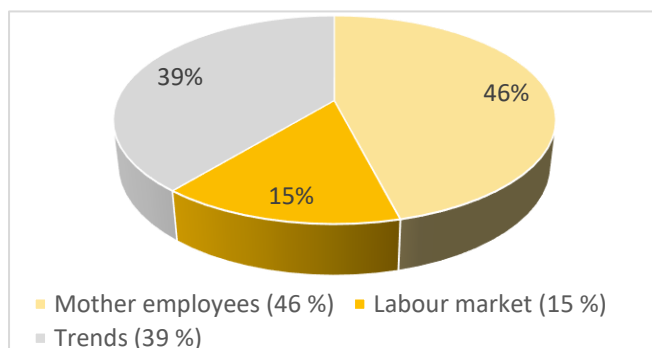
The table gives details of the competences to be highlighted in the different professional documents, in order of frequency. After summarising the results, it can be concluded that the employer needs assessments and forecasts that align with the perception of the skills required. In all cases, the ability to solve problems, communicate and collaborate is seen as a key competency requirement.

Key competences will increasingly define the world of work. Workers need to know their own skills and continuously develop them. It is beyond the scope of our research. Still, it is an exciting area to explore the skills and attitudes to motivation of the future generation of workers that will be needed in the workplace of the future, with challenges that are difficult to foresee from both the employer and the employee side (e.g. the emergence of new professions and new ways of working). Overall, employers expect 39% of workers' basic skills to change by 2030, which is a major challenge for all concerned (*World Economic Forum*, 2025).

In the remainder of the study, our university research group (MATE, the department responsible for the Master's programme in Human Resource Consulting, Institute of Rural Development and Sustainable Economy, Department of Humanities and Vocational Education, and its predecessors) assessed and identified women-focused theses and dissertations through a systematic document review, which were ultimately grouped by topic. The next step was to screen the studies and apply the inclusion criteria for the detailed analysis phase. Data were extracted and synthesised, and relevant information was compiled. Finally, the evidence was evaluated, and our results were described in this study following systematic grouping and weighting.

The Department of Humanities and Vocational Training at the MATE Institute for Rural Development and Sustainable Economy, known in the literature as the "Gödöllő School," produced 2,743 theses between 2002 and 2025. Of these, 115 theses were written on women-focused topics, which corresponds to 4.1925% of the total number of theses. We narrowed the sample down to students enrolled in the master's program in human resources, resulting in 72 theses grouped by topic (*Figure 1*).

Figure 1: Topic groups focused on women employees (n=72) between 2002 and 2025



The deeper analysis time interval of the sample was narrowed down to 2019-2024 for two reasons. One of them was that the results for the previous period had already been published in an earlier study. The other was that, given the year-on-year increase in the number of papers on this topic (altogether 30, 11.41% between 2020 and 2025), we were interested in a more in-depth analysis of recent years. We arrived at the findings in *Table 2* using content analysis.

Out of the 30 papers, we selected those that, based on our criteria, were suitable for inclusion in the next phase of the study. During the detailed and systematic analysis of the papers, we analysed and synthesised 10 papers from the perspective of key competence assessment. In this part of the research, we compared data from 1,510 mothers, most of whom had children under 6, between 2019 and 2024. During the exploration, we synthesised the research questions and hypotheses of the papers, as well as the details of the interviews and questionnaire surveys. We analysed a wide methodological repertoire (individual and group motivational interviewing, involving document analysis (mood barometer, CV analysis), questionnaire surveys and

structured interviews). In the motivational interviews, 98 people were interviewed individually and in groups, and 1,412 people participated in the questionnaire surveys.

Table 2: Number of theses written in Human Resources Consultancy, MA programme between 2020 and 2025

Number of semesters analysed	Semester	Total theses (items)	These focused on women (items)
1	20/21 autumn	0	0
2	20/21 spring	0	0
3	21/22 autumn	21	2
4	21/22 spring	47	4
5	22/23 autumn	21	5
6	22/23 spring	45	3
7	23/24 autumn	19	1
8	23/24 spring	40	5
9	24/25 autumn	7	2
10	24/25 spring	50	7
11	25/26 autumn	13	1
		263	30

During interviews with mothers of young children, the lack of self-confidence, which shapes the basic mood of everyday life, was often mentioned in the early stages of the interviews, during the mood-setting phase. To increase participants' self-esteem, our motivational interviewing (interviewing pregnant women) method, Our Mothers' Motivational Interview (MMI), received a special award in the best practice category at this year's HR+ Online Contest (<https://www.hrplusacademy.eu/best-practices/>) was developed and used in both individual and group interviews. During the sessions, both individual and group discussions were conducted. The steps of this process are described below, followed by a summary of the experience gained.

- Assessing the basic mood regarding the return to the labour market using a 10-point scale, followed by a more detailed verbal explanation.
- Writing a CV, with particular attention to its skills content. Here, mothers who have spent time in childcare list the skills they have that can be used in their reintegration into the labour market.
- Recording the activities they do with their child during their time at home, in everyday life.
- Assigning skills to the listed activities.
- Highlighting the elements of the newly identified skills that are relevant for employment and transferring them to the CV.
- Repeated recording of the basic mood on the mood barometer.

Firstly, perhaps the most important impact of motivational interviewing on mothers is the difference in mood scores between the beginning and end of the

interviews. Regarding the return to the labour market, we interpret the clear mood lift and positive emotional surplus as outcomes of the interviews. The feedback indicated a marked increase in self-esteem as a result of identifying the skills underpinning childcare and care activities, and recognising that most of these skills met employers' expectations and the needs outlined in job advertisements. Respondents were satisfied with the curriculum vitae, which was complemented by accepted skills (e.g., responsibility, problem-solving, flexibility) that could be easily supported by real-world examples.

The analyses were carried out using SPSS and Excel. We sought to understand employers' and workers' expectations and opportunities regarding young children during the reintegration process.

In the introductory phase of motivational interviewing, the complex situation of mothers on the labour market (their problems and opportunities) was revealed. According to the interviewees, it is difficult for mothers to return to the labour market. Still, for most, it is necessary for financial reasons, even though mothers can stay home with their children for up to 3 years. They tend to return when their children are 2-3 years old and see the biggest problems as managing change, loss of confidence, and childcare. Half of mothers return to the same job after having a child. The development of key competences during the home stay shows a different picture. The answers to the research questions show that mothers with young children possess many key skills important for the labour market, but also reveal gaps in their skills. We compared the content of the mothers' sentences with employers' expectations (*Table 3*).

Table 3: Development of key competences of mothers in the light of the competences employers consider necessary.

Key Skill Development while staying at home	Not Improved	Improved	Improved Significantly
mothers' answers (employees' aspect)	technological skills, foreign language competences	dexterity	flexibility, emotional intelligence, service orientation, empathy
HR workers (employers' opinions)	flexibility, professionalism	stress tolerance, empathy	
development level and key skill type according to both parties (employees' and employers' aspects)	confidence	critical thinking, communication, collaboration, learning	creativity, responsibility, problem solving, shared attention

On the positive side, most of the key competences assessed have improved or improved significantly according to both parties. Based on the responses given, mothers feel that most of their skills have improved or improved significantly. They

do not think that their technological skills and foreign language competences have improved during the stay at home. Employers also evaluated the mothers similarly, with the difference that their confidence and resilience did not seem to have improved during the period of child rearing.

According to the mothers interviewed, the benefits of employing mothers with young children are that, during their time at home, they have also developed key skills such as keen attention, time management, a sense of duty, a holistic vision, and logistical thinking. HR staff did not list any reasons why their reintegration was not cost-effective. Other benefits perceived by both stakeholders include the ability to use existing knowledge, so less learning time; they know the company and culture, they have a positive role in building the company's reputation, they are reliable, motivated, grateful, loyal, long-term planning; returning mothers motivate current and new employees; their employment means tax benefits for companies; their reintegration costs less than hiring a new employee. During the time spent at home, the activities preferred by mothers differ from those preferred by employers. Mums prefer baby-mum clubs, attending training courses, reading professional literature, attending events and helping out programmes, and professional forums the least. However, during the time spent at home, the employer would prefer the following activities (in order of importance): reading professional literature, attending company events, helping out programmes, baby-mum club, training, and professional forums. The family-friendly measures preferred by both parties would be (in order of importance): atypical employment, events, maternity welcome package, counselling, more days off, nursery at work, crèche, breast milk cooler, and pram storage. Nursery, crèche and summer camp run by the company would be less preferred measures by employers, while mothers would welcome them. In many cases, mothers feel that the HR department's staff are not handling their return properly. At the moment, our experience shows that the situation in companies is very varied when it comes to equality issues. Some companies address the specific situation of employees with young children for various reasons (e.g., social responsibility, code of ethics, their own values and company culture, or compliance with a standard point). Still, most do not have a well-established, comprehensive scheme to address this altered situation.

To sum up, the responses to the questionnaires and interviews show several positive things, including that mothers are keen to educate themselves while staying at home, they want to be role models for their children, fathers are also often involved in domestic work, especially if the mother is in a managerial position, and women have more opportunities to work in a managerial position. In general, however, the division of labour between women and men within the family is unequal, which affects their careers. The Hungarian economy counts on mothers with young children, and some companies are happy to employ them. In terms of key competences, time spent at home can also bring about positive changes in mothers, which can greatly help them later in the workplace. Key skills include responsibility, empathy, and problem-solving. Fortunately, some employers also recognise these and see them as valuable for mothers with young children. Looking at the sample as a whole, similarities can be seen in all areas, which can be further elaborated to explore the problem in more depth.

CONCLUSIONS

Family is the key to sustainability, and we all have a common responsibility to protect it. Today, women face many disadvantages in the labour market during their careers. Employers have a key role to play in ensuring that workers with young children can keep their jobs. In this study, we sought to determine what mothers think about their own skills and how identifying these skills can help working parents of young children succeed in the labour market. In addition to numerous systemic obstacles, some mothers also struggle with the fact that they lose confidence during their stay at home after childbirth. This lack of confidence is largely fed by feedback from the environment (Görgőy, 2011; Calegari et al., 2024). Overall, our examination found that new mothers have all the key competences that the labour market prefers. Generally speaking, they are trying to get back into the labour market, which is not easy for them for several reasons. Mothers consider it ideal to return to work when their children are 2 or 3 years old, most often returning earlier for financial reasons, which the vast majority later regret. The problems described in the literature analysis of the past decades have also emerged in our research, and our results show that, although there is a shift towards progress, these problems remain prevalent and need to be addressed. The perpetual mothering insecurity is present in most of them, and they generally feel challenged by the multiple roles of being good mothers, good employees, and even developing. In today's ever-changing, incredibly fast-paced labour market, understanding the concepts of change and renewal is becoming essential for all its players, and our well-being depends on the speed and depth of our adaptation. Being professionally prepared and fit is very important in the world of work, and understanding that change is a natural part of life (Kast, 2012). Family is a value to be defended in our values, which gives us strength in the face of everyday challenges. Childbearing is a changing life context, in which the successful reintegration of mothers with young children requires the effective cooperation of all parties involved, and our programme will hopefully provide a solid basis for this.

In the following study, we will identify HR tools that can support the reintegration process. We will show a good practice in attitude formation that we have been involved in for several years, and how key skills of mothers with young children can be developed in practice through career counselling, using individual counselling and structured group sessions with the help of HR counsellors. The aim will be to develop a practical support system in the near future that provides a reassuring vision for both workers with young children and employers.

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DIVERSITY PRACTICES AND ENGAGEMENT IN MULTICULTURAL WORKPLACES: THE MEDIATING ROLE OF ORGANIZATIONAL TRUST CLIMATE – EVIDENCE FROM HUNGARY

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ABSTRACT

This study examines the role of diversity management practices (DMP) in employee engagement in Hungary's service sector. It also studies the mediating role of trust climate in this relationship. Using a self-administered questionnaire completed by 461 foreign employees, the researchers employed structural equation modelling (SEM) to test this model. The results show that trust climate fully mediates the relationship between DMP and employee engagement. Among the studied DMP, diversity training and performance appraisal had the strongest positive impact on trust climate and employee engagement accordingly, while career development had no significant effect. The findings highlight the critical role of trust climate in enhancing the effectiveness of DMP in fostering positive employee outcomes, particularly in multicultural workplaces. This study advances diversity management literature by providing evidence from Hungary, and by emphasizing the strategic importance of trust in enhancing employee engagement through inclusive HRM practices.

Keywords: diversity, diversity management, inclusive workplace, engagement, trust climate, Hungary, service sector

JEL codes: J53, M12, J71

INTRODUCTION

In today's increasingly globalized world, workplace diversity has emerged as a main feature of modern organizations. Globalization, labour mobility, and modern social norms (i.e., contemporary societal expectations for inclusion, equity, and respect to diversity) are driving organizations to have a diverse workforce that comes from different cultures, socioeconomic, and ethnic backgrounds (DeNisi & Griffin, 2015). These rapid changes necessitate greater compliance with equal opportunity policies and call for the implementation of diversity management practices as strategic tools to leverage and address human differences as valuable organizational assets (Woldeyesus, 2024).

Scholars view diversity management as a strategic tool that enhances innovation, improve performance and foster employee engagement (Barak, 2022; Roberson et al.,

2024). A properly managed diversity management practices (DMPs) can transform diverse workplaces in dynamic environments that attract and retain talented employees, increase creativity and achieve sustainable competitive advantage (*Shen et al.*, 2009). However, diversity can bring challenges. If not managed effectively, it may result in adverse outcomes. Moreover, in the absence of supportive organizational climate, interpersonal differences can cause miscommunication, conflict, and diminished trust (*Ely & Thomas*, 2001).

Trust climate, which refers to the employees' shared perceptions of the fairness and trustworthiness of their work environment, leadership, and colleagues (*Costigan et al.*, 1998), plays a pivotal role in shaping the impact of workplace diversity, whether it serves as a source of strength or a source of tension within the organization. When the trust climate is strong it can enable individuals to feel respected, secure, and authorized to contribute their unique perspectives. Trust climate is particularly important in multicultural workplaces, where employees may have differences in expectations and communication styles which can easily impact cooperation. In such contexts trust operates as a relational and strategic mechanism to translate inclusive practices into positive employee outcomes (*Van Knippenberg & van Ginkel*, 2022). This study therefore position trust climate not just an outcome of DMP but also as a mediator between diversity management efforts and employee engagement.

The Hungarian service sector presents a compelling research context. According to the *Hungarian Central Statistical Office (KSH, 2023)* there is a 19% annual growth in foreign employment reaching around 93000 in 2023. The largest groups of foreign employees come from Ukraine, Slovakian, Romania, the Philippines, China and Vietnam (*KSH, 2023*). Most of these foreigner employees work in finance, IT\ administration, hospitality and transportation services. Labour shortages driven by the outward migration of Hungarian workers, have increased the dependence on foreign labour (*Gauriat & Siposhegyi*, 2023).

Although several western studies have explored diversity management practices Central European context remains unresearched regarding this topic especially in regard to understanding how foreign employees experiencing the mechanism of building trust (*Bodor, 2024*). The available studies in this context often emphasize the perspectives of main groups at work or on leaders, leaving the experiences of foreign employees largely unstudied.

This gap in research in Central European generally and Hungarian context specifically is particularly significant, as there is a growing increase in the need to understand mechanism of which diversity management can achieving good levels of engagement at work and how it helps building a trust climate that may facilitate the effectiveness of diversity management on engagement. By addressing this gap, the researchers aim to understand this mechanism and to explore the distinct contribution of four key DMP (diversity training, reward and pay systems, career development, and performance appraisal) to trust climate and engagement.

In addressing this aim, the study may seek to answer the following main research question:

“How do diversity management practices influence employee engagement, and what role does trust climate play in mediating this relationship among foreign employees in Hungary?”

By focusing on this context, this study contributes to giving a deeper understanding of how diversity management practices may foster trust climate and engagement in multicultural companies in central Europe generally, and Hungary especially.

LITERATURE REVIEW

Diversity Management in Multicultural Workplaces

Diversity management has become a strategic aspect of human resources management practices that aim to foster inclusion, equity, and organizational performance. According to *Kupczyk et al.* (2016) it is defined as “voluntary organizational actions designed to generate a process of inclusion of employees from different backgrounds into the formal and informal organizational structures through particular policies, events, and initiatives” (p.83). the fundamental objective of diversity management goes beyond legal obligations or moral expectations to utilize the potentials of diverse workforce to drive innovation and sustainable success (*Shen et al.*, 2014).

Studies have shown that when organizations implement diversity management practices (such as diversity training, equitable performance appraisal, diversity reward systems) are better prepared to face changes in the markets, enhance creativity, and more importantly attract talents with diverse backgrounds (*Barak*, 2022). However, according to *Nishii and Rich* (2013), the effectiveness of diversity management practices are dependent on how these practices are perceived by employees, especially regarding justice, transparency, and inclusion. As much as DMPs are perceived as equitable and fair, they will foster a climate of trust which is considerably essential for teamwork and job security especially in culturally diverse workplaces (*Dirks & Ferrin*, 2001; *Sijal*, 2023). In the absence of such climate of trust, diversity initiatives may be viewed with uncertainty, eventually limiting its impact on employee engagement.

This study focusses on four key practices, diversity reward and pay systems, diversity training career development, and diversity performance appraisal. Reward and pay systems must ensure fair payment and adapt to workforce diversity through discrimination persists (*Shen et al.*, 2009), diversity training enhances intercultural competence and reduce bias (*Devine & Ash*, 2022; *Pendry et al.*, 2007), career development should provide equal opportunities for advancement at work and address barriers for it (*Stone et al.*, 2020). Performance appraisal should maintain culturally neutral and objective criteria for evaluation (*Sharma*, 2016). *Table 1* summarizes the studied DMPs and gives examples of it for a clearer understanding of their concepts.

In order to explain these dynamics, two theories are useful in this context, social exchange theory (SET) which suggests that when employees perceive organizational practices as fair, inclusive and supportive, they reciprocate with trust, engagement and loyalty (*Blau*, 1964; *Cropanzano & Mitchell*, 2005). Trust climate, in turn, emerges when such perceptions are widely shared across employees within the organization, creating a collective belief in the organization's competence, benevolence, and integrity (*Huff & Kelley*, 2003; *Mayer et al.*, 1995).

Table 1: Key studied DMPs

DMPs	Key concept	Example practices
Pay and reward systems	Fair and equitable compensation structures (<i>Shen et al.</i> , 2009)	Inclusive benefits, equal bonus compensation, transparent payments, rewards for inclusion efforts
Diversity training	Special training programs are designed to enhance intercultural competence and reduce bias among employees. (<i>Devine & Ash</i> , 2022; <i>Pendry et al.</i> , 2007).	Workshops, language training for foreigners, cultural exchange events,
Career development	Equal growth opportunities. (<i>Stone et al.</i> , 2020)	Mentoring programs, succession planning, cultural leadership tracking, scholarship programs.
Performance appraisal	Fair and bias-free evaluations (<i>Sharma</i> , 2016).	Multicultural evaluation criteria, bias training for evaluators, (360°) feedback systems.

The second theory is Resource-Based View (RBV) which posits that human capital especially the diverse one can be a unique form of competitive advantage when managed effectively (*Barney & Clark*, 2007; *Richard et al.*, 2003). However, without having a supportive trust climate, diversity initiative may lead to conflict and misunderstanding which may reduce its value (*van Dijk et al.*, 2012). Therefore, trust climate functions as a form of cultural infrastructure that enables diversity practices to be perceived as inclusive and legitimate hence enhancing their organizational effectiveness.

H1: Diversity management practices have a significant positive effect on the trust climate among foreign employees.

Prior research emphasizes the need to disaggregate diversity management practices (DMPs) into specific, actionable components, including diversity training, equitable reward systems, fair performance appraisal, and inclusive career development (*Nishii & Rich*, 2013; *Shore et al.*, 2018). Each component may differentially influence the trust climate depending on implementation quality and organizational context (*Kulik & Roberson*, 2008), we therefore propose the following sub hypotheses:

H1.a: Among the studied diversity management practices, at least one will exhibit a stronger association with the trust climate than others.

Diversity Management Practices and Employee Engagement

Diversity management practices have been found to exert a direct effect on employee engagement in different studies. Employee engagement, as defined by *Schaufeli et al.* (2002) as a positive, fulfilling, work-related state of mind characterized by vigor, dedication, and absorption, is strongly related to how employees perceive

organizational fairness, inclusion and recognition (Saks, 2019). In line with SEM (Blau, 1964), when employees perceive DMP as equitable and fair, they are more likely to reciprocate with high levels of work engagement, loyalty and unrestricted effort (Cropanzano & Mitchell, 2005).

DMP also has important influence in giving the signals that diverse identities are valued and welcomed within the organization (Barak, 2022). This issue is specifically significant for foreign employees, who usually face additional barriers to adjust to the workplace, or develop sense of belonging and maintaining engagement (Farashah et al., 2025). By effectively implementing DMP organizations can help mitigate these barriers, fostering a sense of psychological safety and trust that enable employees to fully engage in their work (Kulik & Roberson, 2008; Saks, 2019).

Several studies support this relationship, Jerónimo et al. (2022) found that inclusive diversity management can enhance employee engagement significantly, especially in multicultural workplaces. Alshaabani et al. (2022) demonstrated that well-designed DMP foster higher levels of engagement in international companies. These results suggest that DMP play a role not only in building trust but also in achieving work engagement. Based on this literature, the following hypothesis is proposed:

H2: Diversity management practices have a significant positive direct effect on employee engagement among foreign employees in Hungary.

Previous studies mentioned that not all DMP equally impact employee outcomes. Previous studies suggest that not all diversity management practices equally influence employee outcomes (Nishii & Rich, 2013; Shore et al., 2018). Practices that can directly impact the employee's recognition and career, such as performance appraisal or training, may have a stronger impact on engagement compared to more general initiatives (Kulik & Roberson, 2008), therefore, understanding which diversity management practices contribute the most to employee engagement is important. Based on this, we propose the following hypothesis:

H2.a: Among the studied diversity management practices, at least one will exhibit a stronger association with employee engagement than others.

Trust Climate as a Psychological Mechanism

Trust climate is characterized by its relational nature in the workplace, it is often referred to as the shared perception among employees at workplace that they can depend on their peers, supervisors, and the organization to be fair, competent and ethical (Mayer et al., 1995). It plays a critical role in reducing uncertainty, supporting collaboration, and fostering psychosocial safety especially within a diverse workplace where employees come from different cultural backgrounds and have different expectations (Alshaabani et al., 2022; Downey et al., 2015).

Trust has been studied widely across psychology and management for decades and is generally recognized as a critical predictor of organizational outcomes. In this study, trust climate according to Huff and Kelley (2003), is conceptualized as employees' collective perceptions of their organization's trustworthiness, encompassing the dimensions of competence, benevolence, integrity, and fairness. It also lines up with the model of Mayer et al. (1995) on organizational trust which refers

to trust as the willingness to be vulnerable to others' abilities, goodwill, and ethical conduct. Further conceptualization of trust is provided by the developmental model of trust by *Levicki and Bunker* (1996) which distinguishes between transactional trust (built on rational calculations), and relational trust one (built on emotions or identity). This framing bridges the SET of (*Blau*, 1964) and the Resources-Based View RBV and supports the notion that trust climate is not only a relational asset but also a strategic resource that enhances the effectiveness of DMPs.

When organizations adopt HRM practices that emphasize fairness and inclusivity they signal to their employees that their values are respected (*Gould-Williams*, 2007). Such signals strengthen mutual respect between employees and their organization especially among the foreign employees who often face extra challenges in adjusting and belonging to the host country (*Farashah et al.*, 2025; *Lima et al.*, 2025)

Trust Climate and Employee Engagement

Employee engagement usually refers to a positive psychological state characterized by vigor, dedication, and absorption in work (*Schaufeli et al.*, 2002). According to *Saks* (2019), improved productivity, retention rate, and employee well-being are common outcomes of high levels of work engagement. Nonetheless, employee engagement does not arise only from such job-related outcomes, but also from organizational climate and interpersonal trust (*Alshaabani et al.*, 2022). Trust enhances employee engagement by developing a perception of psychological safety and encouraging open flow of communication (*Ito et al.*, 2022). Research has shown that when employees perceive their organizational climate as trustworthy, characterized by reliable interpersonal and organizational fairness, they show greater psychological investment (cognitively and emotionally) (*Dirks & Ferrin*, 2001).

In the multicultural and international settings, trust climate plays a critical role in shaping engagement. It helps reduce identity threats among diverse employees and eliminate intergroup tensions, thereby allowing those diverse employees to fully contribute at work (*Farashah et al.*, 2025; *Purdie-Vaughns et al.*, 2008). This hypothesis builds on evidence that:

H3: A positive trust climate significantly enhances foreign employees' engagement in Hungary.

Trust Climate as a Mediator

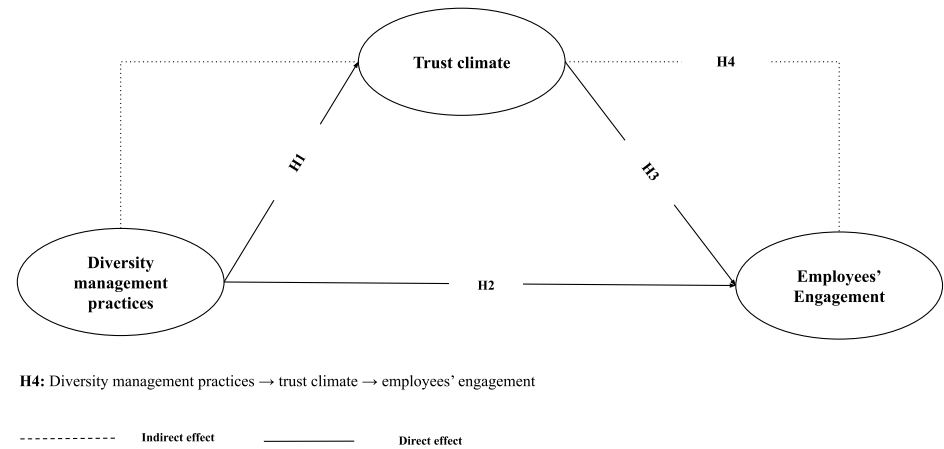
Previous studies have increasingly reported the positive relationship between diversity management practices and employee engagement (*Memon et al.*, 2017; *Saks*, 2019) however the mediating mechanism remains theoretically understudied. Some recent studies identified trust climate as interpretive cognitive pathway through which DMP can enhance engagement outcomes (*Ogbonnaya & Valizade*, 2018). According to *Qi et al.* (2019), trust climate plays a particularly vital role for foreign employees, enabling them to perceive DMPs as fair, inclusive, and equitable. This perception, in turn, facilitates smoother cultural adaptation and integration within international and multicultural workplaces. Similar results were reached by (*Alshaabani & Rudnák*, 2020), who reported that DMP are a strong predictor of trust climate and distributive

justice which emphasizing the role of fairness and equality feelings that DMP is raising among the employees.

By focusing on trust climate as the mediating mechanism, this study responds to a significant gap in current literature (particularly in Central and Eastern Europe) where few studies have investigated how trust bridges the gap between DMPs and engagement. The proposed study model is illustrated in *Figure 1*. Therefore, we propose the following hypotheses:

H4: Trust climate mediates the relationship between diversity management practices and employee engagement among foreign employees in Hungary.

Figure 1: Study's general model



MATERIALS AND METHODS

Sample and Procedures

The current study focuses on foreign employees who work in the Hungarian service sector, either part-time or full-time. Given the unique challenges that this segment of labour market faces in the host country, foreign employees are more likely to experience social and structural inequalities, job insecurity, and conflict especially when diversity management initiatives in the organization are weak (*Alshaabani et al., 2022; Rudolph et al., 2021*). To ensure robust data collection and to mitigate potential common method variance, data were gathered in three waves. In the first one, the respondents answered questions related to diversity management practices. two weeks later, the second wave was conducted by collecting data on trust climate. Finally, in the third wave the respondents answered questions regarding employee engagement. This method reduced the bias associated with single-timepoint data collection and may enhance the construct validity of the studied model (*Podsakoff et al., 2012*).

The study targeted around 744 potential participants working in service sector in Hungary. The participants were chosen using a snowball sampling technique, and data collection tool was an online self-administered questionnaire. Data collection

occurred during the first half of 2023. After assessing the checking the responses 461 valid cases were retained, with a final response rate of 62%. The demographic characteristics of the sample are shown in *Table 2*.

Table 2: Personal Characteristics of the Study's Sample

Item	Category	Count	%
Gender	Male	219	47.6
	Female	242	52.4
Age	18–24	76	16.4
	25–35	184	40.0
	36–44	180	39.1
	45–64	21	4.5
Education	Undergraduate	110	23.8
	Graduate	195	42.4
	Postgraduate	156	33.8
Organization Size	≤ 50 employees	95	20.5
	50–500 employees	193	41.8
	≥ 500 employees	173	37.6
Job experience	≤ One year	142	30.7
	One to three years	254	55.2
	Three to five years	34	7.3
	Above five years	31	6.8
Service sector	Agricultural services	49	10.7
	Research and education	43	9.3
	Financial and insurance sector	106	23.0
	IT services, and administrative	104	22.5
	Transportation and storage and telecoms	50	10.8
	Hospitality sector	44	9.5
	Other service sectors	65	14.2

As can be seen in *Table 2*, the sample shows a balanced gender distribution, with the majority of employees aged between 25 and 44. Regarding education, 42.4% of the participants held a graduate degree, and majority of them worked in medium-sized companies 41.8%. The table further shows that majority of respondents (55.2%) had been working in Hungary for between one and three years. With regard to the sector, the largest share of sector was in the finance sector (23%) while the second largest share was in IT and administrative services.

Measures

Diversity management practices were measured using a 24-item scale adapted from previous studies (*Aldaiyat et al.*, 2019; *Armstrong et al.*, 2010; *D'Netto et al.*, 2014) to cover the four studied practices. The scale includes four key practices, diversity training, reward and pay systems, performance appraisal, career development. A 5-

points Likert scale was used (ranging from 1 “totally disagree” to 5 “totally agree”). The scale has demonstrated strong reliability, unidimensionality, and predictive validity across prior research.

Trust climate was assessed using a 4-item scale adapted from (Huff & Kelley, 2003), using a 7-points Likert scale ranging from 1 (“Totally Disagree”), to 7 (“Totally Agree”). The scale has been validated in multiple studies (Alshaabani et al., 2022).

Employee engagement was measured using the short version of the Utrecht Work Engagement Scale (UWES-9) developed by Schaufeli et al. (2002). The nine-item scale captures three dimensions of engagement: vigor, absorption, and dedication. Responses were recorded on a 7-point Likert scale ranging from 1 (“Never”) to 7 (“Always”). This scale has been widely validated and is recognized for its strong psychometric properties.

Control variables included organization size, employee age, and gender, in line with previous research on organizational climate and employee engagement. A complete list of items of the constructs is presented in Table 3.

Table 3: Measures items

Diversity Management Practices
1. Diversity training in the firm focuses on equal opportunities for training and development
2. This company has done a good job providing training programs that promote multicultural understanding
3. Diversity training sessions are conducted to enhance awareness about gender equality and to remove gender bias issues
4. Mentoring coaching and counseling sessions are there for career development and in taking responsibility to female employees
5. Education about diversity will enhance the company's profitability
6. Diversity training programs sensitize employees to the impact of stereotypes on their own and others' behaviors
7. This company has internal equity in remuneration
8. This company has equity In Benefits and Reward Systems
9. This company has equity in advancement opportunities
10. This company has equal job security
11. This company has equity in status recognition
12. This company has good social interaction
13. Appraisal ratings focus on performance not personality
14. Effective feedback and ongoing support are provided for ethnic employees
15. Appraiser's cultural background dose not influence ratings
16. Multicultural employees are part of appraisal panels
17. Several multicultural employees in senior positions
18. Employees of different backgrounds are encouraged to apply for higher positions
19. There is a career development path for all employees at this company

20. Career management programs for multicultural employees
21. Development opportunities for ethnic employees
22. No discrimination in selection of employees for development programs
23. Appraisal methods in the organizations are objective and job relevant.
24. Minority groups and women receive opportunities for growth
Trust climate
1. There is a very high level of trust throughout this organization.
2. In this organization, subordinates have a great deal of trust for managers.
3. If someone in this organization makes a promise, others within the organization will almost always trust that the person will do his or her best to keep the promise.
4. Managers in this company trust their subordinates to make good decisions.
Employees Engagement
1. At my work, I feel bursting with energy
2. At my job, I feel strong and vigorous
3. I am enthusiastic about my job
4. My job inspires me
5. When I get up in the morning, I feel like going to work
6. I feel happy when I am working intensely
7. I am proud of the work that I do
8. I am immersed in my work
9. I get carried away when I'm working

RESULTS AND DISCUSSION

To test the hypotheses, structural equation modelling (SEM) was conducted using the AMOS 22 software package. SEM was used for its ability to estimate measurement models and structural models simultaneously which allows for the assessment of complex relationships among latent constructs using covariance matrix (Hair et al., 2017). In order to evaluate the mediation, the two-step procedure was employed as recommended by Hair et al. (2017). This procedure involves first testing the direct effects between the independent variable on the dependent and mediator ones. Afterwards, the indirect effects were analysed using SEM path analysis. Mediation was further tested by using Sobel test procedures to determine the significance of the indirect paths and clarity of the mediation type.

The data were first inserted into SPSS version 25, prepared, cleaned, and coded according to the procedures described in the measures section. Reliability and validity analyses were then conducted, followed by mean scores for each variable. Then, the dataset was imported into AMOS V22, where SEM was performed.

Reliability and Validity of the questionnaire

Before testing the hypotheses, the reliability and validity of the questionnaire were assessed to ensure the robustness of the measurement model. To assess reliability, Cronbach's alpha test was performed for all the constructs. Each construct exceeded

the recommended threshold of $\alpha = 0.70$ indicating a high level of internal radiality (Sekaran & Bougie, 2016).

To examine the factor structure, exploratory factor analysis was done using principal component analysis with varimax rotation. The Kaiser-Meyer-Olkin (KMO) value was 0.754, which was exceeding the minimum threshold of 0.60, which assured the sample adequacy (Hair et al., 2017). Moreover, Bartlett's test of Sphericity was significant ($p < 0.001$). the EFA extracted three distinct factors that together explained 61.2% of the total variance, which exceeded the 50% benchmark for acceptable construct validity.

After that, confirmatory factor analysis was utilized to evaluate convergent and discriminant validity. average variance extracted (AVE) for all constructs exceeded the minimum threshold of 0.50. Furthermore, composite reliability (CR) values surpassed 0.70, indicating strong convergent validity and construct reliability (Bagozzi & Yi, 1991). The results are presented in Table 4.

Table 4: The model's internal consistency and convergent validity

Variable	Items	Alpha Cronbach	AVE	CR
Diversity management	24	0.93	0.52	0.93
Diversity training awareness	6	0.83	0.56	0.81
Diversity reward	6	0.88	0.53	0.85
Diversity performance	6	0.82	0.50	0.75
Diversity career development	6	0.85	0.50	0.75
Trust climate	4	0.81	0.67	0.84
Employee engagement	9	0.93	0.67	0.92

To assess discriminant validity, both the Fornell-Larcker criterion and the Heterotrait-Monotrait (HTMT) ratio were employed. As it is shown in Table 5 and Table 6, the discriminant validity for both criteria was assessed.

Table 5: Fornell-Lacrcker Criterion

Variables	DMP	TC	EE
DMP	0.814		
TC	0.438	0.798	
EE	0.500	0.346	0.901

Note: TR: trust climate; DMP: diversity management practices; EE: employee engagement

Table 6: Heterotrait-Monotrait Ratio (HTMT)

Variables	DMP	TC	EE
DMP	-		
TC	0.512	-	
EE	0.502	0.398	-

Note: TR: trust climate; DMP: diversity management practices; EE: employee engagement

Correlation Matrix

Descriptive statistics and Pearson correlations between variables are presented in Table 7. Notably, diversity management practices (DMP) were positively correlated with both trust climate ($r = 0.432$, $p < 0.01$) and employee engagement ($r = 0.426$, $p < 0.01$).

Table 7: Descriptive analysis and correlation matrix

Variables	Mean	SD	1	2	3	4	5	6
1. Gender	-	-	-					
2. Age	1.89	0.443	-.082*	-				
3. size	1.89	0.744	-0.044	0.275**	-			
4. DMP	3.56	0.510	0.192**	-0.016	0.332**	-		
5. TC	4.87	1.033	-0.022	0.092*	0.351**	0.432**	-	
6. EE	4.357	1.11	-0.133**	0.307**	0.304**	0.426**	0.338**	-

Note: TR: trust climate; DMP: diversity management practices; EE: employee engagement

Hypotheses test

The SEM results (presented in Table 8) showed several significant relationships that support the suggested hypotheses. Gender had a significant negative effect on employee engagement ($\beta = -0.203$, $p < 0.001$), suggesting that female foreign employees report lower levels of engagement compared to male employees. Age showed a positive effect on both trust climate ($\beta = 0.064$, $p < 0.01$), and employee engagement ($\beta = 0.190$, $p < 0.001$), which indicates that older employees tend to perceive a constructive trust and show higher engagement at work. While organizational size could predict significantly trust climate only ($\beta = 0.313$, $p < 0.001$).

The total effect of diversity management practices (DMP) on employee engagement was significant ($\beta = 0.348$, $p < 0.001$), which supports hypothesis H2, however, when trust climate was included as a mediator, the direct effect of DMP on employee engagement became non-significant ($\beta = 0.089$, $p > 0.05$), indicating full mediation. Regarding the dimension level, several aspects of DMP had a direct effect on employee engagement significantly. Diversity performance had the strongest influence ($\beta = 0.525$, $p < 0.001$), then diversity career development ($\beta = 0.329$, $p < 0.001$), followed by diversity rewards and pay systems ($\beta = 0.147$, $p < 0.01$), and diversity training ($\beta = 0.141$, $p < 0.05$). these findings support hypothesis H2. a, suggesting that although all used DMP contributed positively, performance appraisal showed the strongest influence on engagement.

Trust climate was found to significantly mediate the relationship between DMP and employee engagement. DMP could predict positively trust climate ($\beta = 0.641$, $p < 0.01$), and trust climate in turn positively associated with employee engagement ($\beta = 0.282$, $p < 0.001$), which confirms hypotheses H1, and H3. The indirect effect of DMP on employee engagement through trust was also significant ($\beta = 0.051$, $p < 0.001$), supporting H4. these results indicate the role of trust climate as a key factor

in enhancing the effectiveness of inclusive HR practices in enhancing employee outcomes.

Further analysis showed that the DMP dimensions differed in their effects on trust climate. Diversity training had the strongest positive impact on trust climate ($\beta = 0.544$, $p < 0.001$), followed by diversity reward and pay systems ($\beta = 0.100$, $p < 0.01$) and diversity performance appraisal ($\beta = 0.116$, $p < 0.05$). However, diversity career development had no significant effect on trust climate ($\beta = 0.048$, $p > 0.05$), which supports H1.a. These results suggest that while all practices contribute to employee engagement, only specific ones, are perceived as fostering trust climate

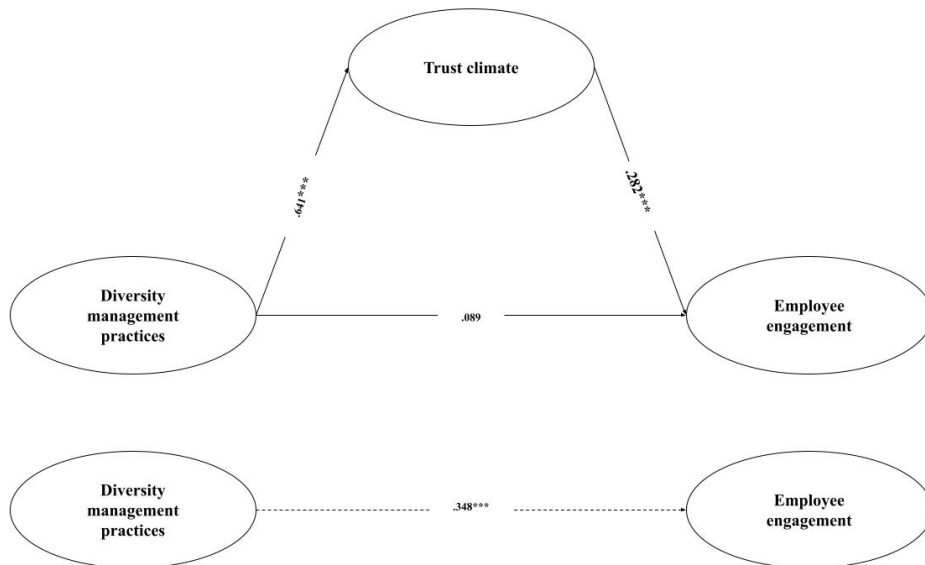
The study's model explained 24% of the variance in trust climate ($R^2 = 0.24$) and 49% of the variance in employee engagement ($R^2 = 0.49$), indicating its explanatory power. the results are shown in Table 8. Figure 2 shows the results of SEM in the proposed model

Table 8 : SEM Results

Model's paths				β	S.E.	T-value	Sig
Gender	→	TR	Path c'	-0.015	0.050	0.596	NS
Age	→	TR		0.064	0.036	2.484	**
Size	→	TR		0.313	0.042	7.693	***
Gender	→	EE		-0.203	0.079	-4.729	***
Age	→	EE		0.190	0.092	4.325	***
Size	→	EE		0.003	0.057	0.056	NS
DMP	→	EE	Path b	0.089	0.090	0.0685	NS
DTR	→	EE		0.141	0.067	2.103	**
DRE	→	EE		0.147	0.056	2.550	**
DCD	→	EE		0.329	0.091	3.580	***
DPF	→	EE		0.525	0.059	8.845	***
TR	→	EE	Path a	0.282	0.061	3.988	***
DMP	→	TR		0.641	0.000	5.2114	**
DTR	→	TR		0.544	0.066	9.083	***
DRE	→	TR		0.100	0.064	3.150	**
DCD	→	TR		0.048	0.110	0.983	NS
DPF	→	TR		0.116	0.069	2.329	**
DMP	→	EE	Path c	0.348	0.079	7.955	***
Indirect effects							
DMP → TR → EE				0.051			***
R ²				TR		0.24	
				EE		0.49	

Note: TR: trust climate; DMP: diversity management practices; EE: employee engagement; DTR: diversity training; DRE diversity reward and pay systems; DCD: diversity career development; DPF: diversity performance appraisal. NS: not significant; *** $p < 0.001$; ** $p < 0.005$

Figure 2: SEM results of the studied model



Note: NS: not significant; *** $p < 0.001$; ** $p < 0.005$

DISCUSSION

This study investigated how diversity management practices (DMP) affect employee engagement within Hungary's service sector, specifically analyzing how trust climate mediates this relationship. The results have both statistically significant and theoretically meaningful findings that advance our understanding of how DMP, and workplace climate, together shape employee experiences and outcomes.

The Direct Impact of total DMP on Engagement

The results demonstrated that DMP significantly predict employee engagement corroborating previous research that underscores the positive association between DMP and various employee-related outcomes, including motivation, commitment, psychological empowerment, and engagement (Alshaabani et al., 2022; Jerónimo et al., 2022). Within Hungary's service sector, where the workforce is remarkably international, employees who perceive their organizations as inclusive and supportive of diversity tend to exhibit stronger emotional and cognitive attachment to their work. This finding aligns with the results of Maj (2023) et al., who observed that in the Polish context, an inclusive work environment and perceived diversity significantly boost job satisfaction. This highlights the critical role of perceived inclusion in the workplace, particularly within post-socialist economies. Moreover, the study results line up with social exchange theory (Blau, 1964), which suggests that employees reciprocate fair treatment and organizational recognition with

heightened commitment (*Ghasempour Gangi & Kafahpour, 2017; Johnson & Ganji, 2020*).

Additionally, the study's outcomes can be interpreted through the Resource-Based View of the firm (*Barney & Clark, 2007*), which asserts that internal resources—particularly those that are valuable, rare, and difficult to replicate—can sustain a competitive advantage. Effectively managed workforce diversity exemplifies such a resource, as it enhances organizational creativity, adaptability, and market responsiveness (*Cox & Blake, 1991*). The positive relationship between DMP and engagement observed in this study suggests that organizations leveraging diverse talent pools can foster improved collaboration, motivation, and enthusiasm among employees. This reinforces the notion that inclusive practices not only uphold equity but also strengthen organizational competitiveness by optimizing human capital as a strategic asset (*Richard et al., 2003*).

DMPs to engagement

To understand the relationship between DMP and employee engagement in a greater depth, the separate impact of each studied DMP was analysed. The results showed that diversity performance appraisal had the strongest impact on employee engagement, supporting prior findings that fair and transparent evaluation of performance enhances positive employee attitudes (*Goswami & Goswami, 2018*). Career development also had a significant influence on engagement which aligns with earlier studies (*Chandani et al., 2016*) which suggest that opportunities for professional and personal growth contribute to higher levels of engagement. Diversity reward and pay systems were also found to have a significant positive impact on employee engagement, this indicates that foreign employees value equitable and inclusive compensation policies as part of their engagement experience. Diversity training showed a moderately significant effect reflecting its importance in building awareness and signalling inclusive values.

The Direct Impact of total DMP on trust climate

The findings of this study showed that DMP positively predicted trust climate, confirming the essential role of inclusive HR practices in fostering positive organizational climate. These results are in line with SET (*Blau, 1964*). Moreover, this result support previous studies findings which suggest that DMP when perceived as authentic and fair, can shape the broader relational climate of the workplace (*Dirks & Ferrin, 2001*).

Trust Climate as Mediator

The findings of the study confirm that trust climate fully mediates the relationship between DMP and employee engagement. While the total effect of DMP on engagement was significant, the direct path became non-significant when trust climate was included, which indicates that perceptions of trust are the primary psychological mechanism that links inclusive practices to engagement. Furthermore, this suggests that trust is not merely an outcome of DMP but a core element that fosters the effectiveness of such practices in influencing broader organizational outcomes. This result is

consistent with prior findings that DMP influence attitudes primarily via trust-related perceptions (*Choi & Rainey, 2010*), suggesting that without a supportive trust climate, diversity initiatives may remain symbolic rather than practical.

Theoretically, this finding aligns with SET which posits that employees tend to reciprocate supportive HR practices with commitment and effort when they trust the intentions and reliability of the organization. The results also align with the resource-based view (RBV) (*Barney & Clark, 2007*), as from this view trust climate is a valuable, rare, and hard-to-achieve intangible resource that enables organizations to turn diverse human capital into stronger engagement. Practically, these results support previous studies such as (*Ogbonnaya & Valizade, 2018; Qi et al., 2019*), which found that trust climate acts as an interpretive tool that enables employees, especially migrant ones, to experience DMP as fair and psychologically safe, thus enhancing their engagement at work.

Alternative explanations for the full mediation are also possible. In multicultural workplaces such as Hungary's service sector, trust may be necessary precondition for DMP to influence engagement, without trust, diversity initiatives and policies may be met with caution. Another explanation might be that when trust climate is included, it captures most of the positive impact of DMP, leaving no direct significant path to engagement. Finally, if some employees have experienced diversity initiatives as inconsistent or symbolic, this could weaken the direct relationship and make trust the deciding factor in whether these initiatives can positively affect engagement.

DMPs to trust climate

The findings showed trust climate was not an outcome of all the studied DMPs. Among them, diversity training was the most impactful on trust climate, suggesting that high quality, and well-planned training programs can enhance perceptions of fairness and psychological safety. This aligns with the suggestions of (*Grissom & Quarterly, 2018; Singh et al., 2013*) who mentioned that trust building is a result of the diversity training efforts. Performance appraisal and reward systems also positively affected trust, supporting the notion that fair recognition and evaluation systems contribute to more trusting organizational climate. However, career development did not significantly influence trust climate, possibly because of perceived barriers to promotion or due to unclarity in career pathways for foreign employees.

These findings confirm that diversity management practices, when implemented with fairness and strategic clarity, enhance employee engagement and cultivate trust. Notably, trust climate fully mediated the relationship between DMPs and engagement, highlighting its essential role as a psychological and relational mechanism. By removing structural and perceptual barriers through inclusive HRM practices, organizations can foster trust and unlock the full potential of a diverse workforce.

CONCLUSION

This study examined the role of DMP in predicting employee engagement in Hungarian service sector. Exploring the mediating role of trust climate. The findings confirmed the role of DMP in enhancing engagement especially when embedded

within a trust climate. Trust climate played a critical role in linking DMP efforts to achieving employee outcomes, reinforcing the argument that applying inclusive practices should be accompanied by social support structures to be effective. Among the studied DMP, diversity training and performance appraisal were the most effective in fostering trust climate and employee engagement accordingly. While career development had a limited impact. Overall, this study provides a strong support for the notion that trust climate is a strategic resource that can help achieve engagement and fostering the well-designed diversity practices in creating positive outcomes.

This study advances the current understanding of how DMP enhance employee engagement by identifying the role of trust climate in mediating this relationship. By integrating SET and the Resource-Based View (RBV), this study advances the understanding of how inclusive DMP can build trust climate, which is particularly important for sustaining engagement among foreign employees in Hungary. Moreover, the findings highlight the role of diversity practices separately in building trust climate and achieving a positive employee engagement.

This study also provides some practical insights for managers. In Hungarian context, these results suggest that organizations can enhance the levels of engagement of their employees by applying diversity management practices within a supportive trust climate, especially in the sectors facing shortages in labour force. Implementing well-prepared diversity training programs, and transparent performance appraisal methods may be particularly effective in retaining foreign talents.

Despite the contributions of this study there are few limitations. First, the study focused on Hungarian service sector and foreign employees but may limit the generalizability of the findings to other sectors or employee groups. Additionally, trust climate was measured based on a brief scale, future studies may consider a multi-dimensional measurement to gain a more comprehensive understanding of trust climate. The future studies may place a greater emphasis on employees' ethnicity and nationality, as these factors could serve as important control variables in how predicting diversity initiatives are perceived.

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PARTICIPATIVE LEADERSHIP: A SECTORAL REVIEW OF HYBRID LEADERSHIP FRAMEWORKS

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ABSTRACT

This review paper investigates how participative leadership is understood and practiced across Algeria's healthcare, education, industrial, and local governance sectors. Using an integrative literature review approach, it brings together national and international studies to evaluate both the strengths and limitations of participative leadership within the Algerian institutional context. The findings show that participative leadership can strengthen motivation, spark innovation, and build organizational trust. However, its impact is often held back by centralized authority, rigid bureaucracy, and weak civic infrastructure. Drawing on insights from multiple sectors, the paper proposes a hybrid leadership model that blends Likert's structural openness, Vroom and Jago's situational adaptability, and Bass and Riggio's transformational vision. Tailored to Algeria's governance challenges, this model highlights the importance of civic education, leadership development, and decentralization as enabling conditions. Ultimately, the review offers a context aware framework to guide future research, inform policy, and support more inclusive and responsive governance in Algeria and other transitional systems.

Keywords: participative leadership, Algerian governance, institutional reform, civic engagement, organizational dynamics, hybrid leadership model

INTRODUCTION

Participative leadership is increasingly recognized as a valuable approach to governance and management, particularly in contexts where trust, inclusion, and shared responsibility are essential for achieving meaningful results. This conceptualization is supported by evidence from a range of global contexts, where participative leadership has been linked to stronger communication, higher motivation, increased innovation, and improved institutional responsiveness (Gastil, 1994; Fatoki, 2023; Miao & Zhang, 2023).

However, putting participative leadership into practice is rarely straightforward. Its effectiveness depends not just on leadership intentions, but also on broader institutional frameworks, cultural expectations, and the degree of flexibility within governance systems. In highly centralized or bureaucratic settings, participative

practices often remain superficial used more as symbolic gestures than as meaningful shifts in power sharing. Algeria provides a particularly compelling case for examining these dynamics. Although national discourse increasingly promotes participatory governance, real world leadership practices often vary widely between sectors such as healthcare, education, industry, and local administration.

This review paper takes a close look at how participative leadership has been studied and implemented within Algerian institutions. Rather than introducing new empirical findings, it draws on existing academic literature to explore how the concept has been defined, interpreted, and applied across different sectors. The aim is twofold: first, to identify recurring patterns, challenges, and enabling conditions that shape participative leadership in Algeria; and second, to link these national insights with international research and theory, offering a broader framework that can guide leadership development in similar governance environments.

One of the key strengths of this review lies in its cross-sector and integrative approach. Rather than treating each institutional setting in isolation, the paper identifies shared themes and contrasts, placing Algerian experiences within the context of well-established leadership theories such as Likert's System 4, Vroom and Jago's contingency model, and transformational leadership frameworks. In doing so, it develops a hybrid conceptual model tailored to Algeria's unique governance landscape, where both structural reform and cultural adaptation are needed.

The structure of the paper is as follows: Section 2 reviews the core concepts of participative leadership, drawing from global and local sources. Section 3 explains the methodology used to select and analyze relevant literature. Section 4 presents the main findings, organized by sector and supplemented with comparative insights. Finally, Section 5 offers conclusions and practical recommendations for researchers, policymakers, and institutional leaders.

By clarifying what is known, what is working, and where key gaps remain, this review aims to support ongoing efforts to strengthen participative leadership in Algeria and in other transitional systems facing similar institutional hurdles.

Participative leadership has gained steady recognition as an effective leadership style across both public and private sectors. At its heart, it involves giving employees or stakeholders a real voice in decision making both in strategic matters and in everyday operations. Unlike more hierarchical or autocratic approaches, participative leadership encourages collaboration, honest feedback, and joint problem solving. The result is often a stronger sense of trust, shared responsibility, and organizational belonging (Gastil, 1994). For example, Chan (2019) emphasizes that transparent dialogue and effective delegation are essential to helping employees feel that their input truly matters. This isn't just theoretical: Fatoki (2023) found a 28% rise in job satisfaction among South African SMME employees, with psychological empowerment accounting for more than half of the improvement. In Kenya, participative leadership has also proven practical Ochieng et al. (2023) showed it explained nearly 7% of performance variance in manufacturing SMEs, significantly boosting productivity, revenue, and innovation.

The roots of participative leadership go back to Kurt Lewin's classic studies in 1947, which showed that democratic leadership styles created stronger group

cohesion and satisfaction than either autocratic or laissez faire models. This early work laid the foundation for later contributions. *Likert* (1967), for instance, introduced the System 4 model, portraying participative leadership as the most advanced management style built on shared decision making, open communication, and supportive relationships. *Vroom and Jago* (1988) expanded this thinking with a contingency approach, showing that leaders need to tailor the level of participation to the situation, based on how critical a decision is and how much expertise the team brings. Adding a more motivational lens, *Bass and Riggio's* (2006) transformational leadership theory demonstrated how shared authority, when paired with a compelling vision, can drive innovation and performance even in traditionally rigid systems.

While each of these theories brings something unique, their relevance varies depending on the institutional context. Likert's model, for example, assumes a cooperative and relatively stable organization conditions that may not always apply in countries like Algeria, where bureaucratic inertia and centralized control remain strong. Vroom and Jago's flexible, situational model may be more applicable, offering practical ways for leaders to engage others without abandoning structure. Meanwhile, transformational leadership helps fill in motivational gaps, inspiring change and trust where formal mechanisms fall short. These distinctions matter in Algeria, where decentralization policies often coexist with tight administrative control. A hybrid model, one that blends participative structures, situational flexibility, and visionary leadership, may be more effective in adapting to local constraints while gradually building a more engaged culture.

Looking beyond theory, global empirical research has also affirmed the benefits of participative leadership. *Miao and Zhang* (2023) found that it strongly predicts "voice behavior" among public servants, especially when employees feel a strong connection to their organization and work in low power distance cultures. In Pakistan, *Khattak et al.* (2023) reported that participative leadership encouraged organizational citizenship behavior through psychological empowerment. Emotional intelligence, particularly empathy, has also emerged as a key ingredient: *Ugoani* (2023) showed that emotionally attuned leaders are better at building committed, collaborative teams. In education, *Sagnak* (2016) found that intrinsic motivation plays a central role in linking participative leadership to proactive behaviors, reinforcing the importance of internal drivers for sustained engagement.

Algerian research has begun to echo these global findings, though with important contextual nuances. In the health sector, *Amraoui et al.* (2024) found that participative leadership helped reduce "organizational silence," accounting for 7.6% of the variance suggesting that giving employees a voice may help them speak up about concerns. In industry, *Amel* (2025) highlighted how digital tools enhanced participative leadership practices at CETIM (GICA Group), boosting innovation and knowledge sharing. In universities, *Ghideri and Bousalem* (2023) showed that participative leadership helped reduce staff cynicism, especially when civic virtue mediated the effect. *Meziani et al.* (2025), working in the education sector in Maghnia, found a significant improvement in decision making quality ($\beta = 0.346$, $p < .001$) under democratic leadership structures.

However, challenges remain particularly at the local governance level. Despite laws promoting citizen engagement, actual participation tends to be weak. *Benoumeldjadj and Bouchareb* (2022), using ELECTRE analysis in Constantine, found that most residents remained disengaged due to limited awareness and highly centralized financial structures. *Nedjar* (2025), comparing the CapDeL program with the El Ghaith association, revealed that while civil society groups can build local capacity, they often struggle against fragmented legal systems, inconsistent political will, and a lack of funding.

Overall, while the research base is expanding, it still has clear limitations. Many studies are cross-sectional, which makes it hard to understand how participative leadership develops or fails over time. The focus is also heavily tilted toward the public sector, leaving private businesses and the informal economy underexplored, despite their growing importance in Algeria's development. And although hybrid leadership models are often discussed, few have been tested or applied in real world contexts. Moving forward, research would benefit from more longitudinal studies, broader sectoral coverage, and mixed method approaches. These steps would help clarify how participative leadership can take root, evolve, and thrive within Algeria's complex and changing institutional landscape.

RESULTS AND DISCUSSION

This section synthesizes the key findings from the literature on participative leadership in Algeria, drawing on sector specific insights while connecting them to broader international evidence. By organizing the discussion thematically, covering healthcare, education, industry, and local governance, it becomes possible to identify both the enabling conditions and the persistent constraints shaping participative leadership in practice. Where appropriate, parallels with other national contexts help illuminate how Algeria's unique institutional dynamics shape both potential and limitations.

Participative leadership in Algeria's public healthcare sector shows promising but limited effects. In Biskra, *Amraoui et al.* (2024) found that participative practices explained 7.6% of the variance in organizational silence. While this is modest, it suggests that giving staff a voice can help challenge communicative inhibition within hierarchical systems. A similar pattern emerges in the Chinese public sector, where *Miao and Zhang* (2023) showed that participative leadership improves employee voice, particularly in high power distance contexts. These parallels are noteworthy, as both countries operate within centralized governance models, and both reveal that even incremental participatory efforts can foster more open communication. However, Algeria's healthcare governance remains structurally rigid, with few formal channels for staff input. Unlike systems in Sweden or Brazil, where participation is built into both policy and operations, Algeria continues to rely on top-down administration. Moreover, the cross-sectional and regional scope of current studies limits generalizability. Without deeper institutional reform, participative leadership risks remaining rhetorical rather than substantive.

By contrast, Algeria's higher education sector presents more consistent evidence of participative leadership having a positive institutional impact. *Ghideri and Bousalem* (2023) found that such leadership practices helped reduce organizational cynicism, with civic virtue acting as a mediating mechanism. When employees perceive their leaders as ethical and inclusive, they tend to engage more meaningfully with institutional goals. Supporting this, *Meziani et al.* (2025) demonstrated that democratic leadership significantly improved decision-making quality among educational staff in Maghnia ($\beta = 0.346$, $p < .001$). These findings underscore the motivational core of participative leadership: it works not just by enabling participation, but by reinforcing the belief that participation matters. Similar insights appear in international literature. *Sagnak* (2016), studying Turkish schools, found that intrinsic motivation fully mediated the relationship between participative leadership and change oriented citizenship behavior. In both contexts, motivation emerges not simply as an outcome but as the mechanism that makes participative leadership effective. That said, these benefits in Algeria appear largely confined to the university level. Primary, secondary, and vocational institutions remain steeped in hierarchy. Expanding participative practices will require institutional reforms, targeted leadership development, and a cultural shift toward shared governance.

In the industrial sector, participative leadership also shows signs of supporting innovation and learning, albeit in isolated cases. *Amel* (2025), in a qualitative case study of CETIM (a GICA Group subsidiary), found that ICT supported participative practices encouraged knowledge sharing and enabled grassroots innovation. A notable example is found in CETIM's internal operations, where managers introduced monthly cross-functional workshops involving engineers, technicians, and administrative staff to co-develop process improvements. This participative approach, enhanced by digital collaboration tools, fostered open communication and generated practical innovations that reduced production bottlenecks and improved workflow efficiency. The CETIM case demonstrates that participative leadership can deliver measurable operational gains when leaders establish inclusive structures for problem solving and act on employee generated ideas (*Amel*, 2025). This case provides a concrete example of participative leadership success in practice. At CETIM, employee participation in operational workshops directly contributed to improved efficiency, reduced production bottlenecks, and enhanced innovation capacity, demonstrating how participative practices can yield tangible organizational benefits. This aligns with *Ochieng et al.*'s (2023) study in Kenya, which showed that participative leadership in manufacturing SMEs accounted for 6.9% of performance variance ($\beta = 2.901$, $p < .001$), particularly in innovation and productivity. These findings highlight the creative potential of participative leadership, especially when combined with enabling tools. Still, the broader Algerian industrial landscape is marked by centralized control and limited autonomy at the leadership level. Unlike innovation ecosystems in Germany or South Korea, where leadership development is formalized, Algeria lacks national mechanisms to scale successful models like CETIM. A dual strategy is needed: institutionalizing leadership training and offering incentives, such as innovation

grants, to reward participative behavior. Without structural support, promising examples may remain exceptions.

Local governance in Algeria presents perhaps the most challenging terrain for participative leadership. Although national policy frameworks endorse citizen participation, implementation remains uneven and often symbolic. In Constantine, *Benoumeldjadj and Bouchareb* (2022) found that participatory planning is undermined by centralized financial systems, administrative inertia, and weak civic engagement. *Nedjar's* (2025) comparison of the CapDeL program and the El Ghaith association reinforces this view: while both initiatives succeeded in mobilizing local communities, legal fragmentation and political resistance severely limited their effectiveness. Algeria's decentralization framework remains largely administrative, with local governments operating under substantial oversight from the central state and possessing limited fiscal autonomy (*Serir*, 2022). Although elected municipal councils are in place, their decision-making authority is often constrained by centrally controlled budget allocations and approval processes. This partial decentralization reduces the scope for local leaders to adopt and sustain participative leadership strategies, as they lack both the resources and the legal mandate to implement community driven initiatives. In contrast, fully decentralized systems - where local authorities retain greater control over budgets and policy decisions - tend to provide more favorable conditions for participative leadership, as demonstrated by participatory budgeting programs in Brazil, which have been shown to improve public service provision and social outcomes (*Gonçalves*, 2014). These patterns are not unique to Algeria. Morocco, for example, has faced similar barriers in participatory budgeting, while Brazil's success in Porto Alegre was built on robust civic education, transparent procedures, and meaningful devolution of power. In Algeria, however, without parallel investments in civic infrastructure, community training, and institutional safeguards, participative leadership risks remaining procedural rather than transformative. Indeed, the degree of administrative and fiscal decentralization fundamentally shapes how participative leadership can be practiced within local governments. In Algeria, decentralization remains largely administrative, with municipalities possessing limited fiscal and decision-making autonomy (*Serir*, 2022). This centralized structure constrains local leaders' capacity to implement inclusive decision-making processes or respond flexibly to community needs. When local authorities depend on central approval for budgets and projects, participative initiatives often remain symbolic rather than substantive. In contrast, evidence from more devolved systems such as Brazil's participatory budgeting programs shows that greater local autonomy allows leaders to institutionalize citizen participation and achieve tangible improvements in service delivery (*Gonçalves*, 2014). Strengthening the effectiveness of participative leadership in Algeria therefore requires not only leadership development but also deeper fiscal and administrative devolution that empowers municipalities to act as genuine agents of change.

The effectiveness of participative leadership in Algeria is strongly shaped by its cultural configuration. Existing comparative evidence indicates that Algeria combines relatively high power distance with strong collectivist tendencies and high uncertainty

avoidance (*World Population Review*, 2025). These traits influence how participative leadership is interpreted and practiced across sectors. Cross-cultural research, including the *GLOBE Study of 62 Societies* (House et al., 2004), demonstrates that leadership effectiveness depends on the alignment between participative practices and societal values concerning authority, collectivism, and uncertainty tolerance. High power distance reinforces deference to authority and can restrict upward voice, whereas collectivism promotes loyalty and cooperation once interpersonal trust exists. Strong uncertainty avoidance reflects a preference for stability, explicit rules, and predictable processes *conditions that can slow experimentation but favor structured participation*. Taken together, these dimensions shape how participative leadership translates into tangible outcomes. In Algeria, leadership effectiveness therefore depends not only on managerial intention but also on the leader's cultural competence, the ability to navigate hierarchical expectations while fostering inclusion and open communication. Consequently, participative leadership tends to be most effective when leaders respect hierarchical order, create transparent participation mechanisms, and introduce collaborative practices gradually to build psychological safety. These cultural patterns clarify why participative leadership gains traction in sectors such as healthcare and education, where institutional procedures provide predictable frameworks for collaboration.

Across all sectors, several cross-cutting themes emerge. First, psychological empowerment consistently appears as a key mediating factor whether in reducing organizational silence in healthcare, enhancing motivation in education, or supporting innovation in industry. In this regard, Algeria's cultural dimensions provide valuable insight into both the potential and the limitations of participative leadership. Earlier empirical work reports medium power distance (5.36/10), high collectivism (7.12/10), and high uncertainty avoidance (8.6/10) (Mercure, Sayad, & Boucher, 1997). More recent Hofstede based data confirm Algeria's high power distance (≈ 80), indicating strong acceptance of hierarchical authority and centralized decision-making (*World Population Review*, 2025). High power distance can discourage open dialogue and limit bottom-up participation, whereas strong collectivism fosters loyalty, cohesion, and consensus when trust exists. Elevated uncertainty avoidance reflects a preference for stability, clearly defined rules, and predictable processes, which can slow the adoption of new participative practices unless these are introduced gradually and supported by transparent procedures. Taken together, these traits suggest that participative leadership in Algeria is most effective when it respects established authority, leverages group solidarity, and introduces inclusive decision making through clear and predictable frameworks.

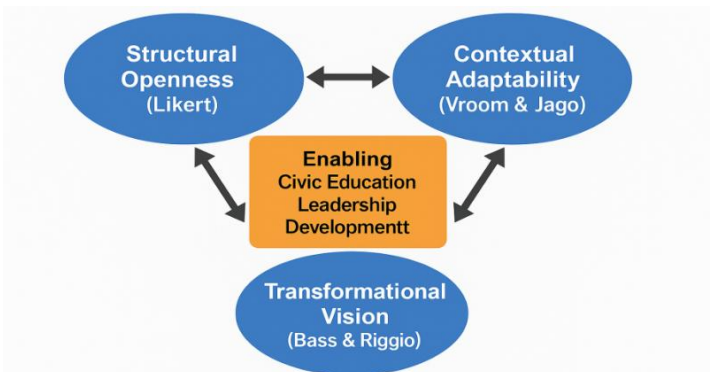
While theoretical models such as *Likert's* (1967) System 4, *Vroom and Jago's* (1988) contingency theory, and transformational leadership offer valuable frameworks, they can only succeed in environments that support openness, trust, and distributed authority. In light of this, the review proposes a hybrid leadership model tailored to Algeria's governance landscape. This model combines:

- Fostering structural openness (*Likert*, 1967): Two-way communication and shared decision making.

- Applying situational flexibility (Vroom & Jago, 1988): Adapting participation to task complexity and team expertise.
- Inspiring ethical commitment (Bass & Riggio, 2006): Building trust and a shared vision to strengthen institutional integrity.

To be effective, this model must be supported by digital collaboration tools, civic education programs, and institutional incentives that encourage participative behaviors. Without these enabling conditions, even the most theoretically sound leadership frameworks are unlikely to achieve meaningful traction.

Figure 1: A Hybrid Leadership Framework for Participative Practices in Algerian Institutions



Sources: Adapted from Likert (1967), Vroom & Jago (1988), and Bass & Riggio (2006), contextualized using Algerian empirical literature.

The evidence reviewed offers cautious optimism. When participative leadership is tailored to Algeria’s institutional realities and paired with structural support, it has the potential to enhance effectiveness, inclusion, and innovation. However, its long-term viability depends on systemic reforms, particularly decentralization, expanded civic education, and sustained leadership development.

The following tables summarize the empirical landscape. *Table 1.* categorizes Algerian studies by sector, method, and key findings, while *Table 2.* offers comparative insights from international cases.

Table 2. summarizes key international studies that inform the Algerian context, highlighting how participative leadership operates under different institutional and cultural conditions.

As shown in *Table 2.*, international evidence from contexts such as Brazil, Kenya, Turkey, and more recently Hungary (Kovács, 2024) demonstrates that participative and collaborative leadership practices can improve transparency, innovation, and civic trust even under varying levels of centralization. These comparative insights provide a useful lens for interpreting Algeria’s current governance reforms, where similar participatory approaches are beginning to emerge.

Table 1: Summary of Participative Leadership Research in Algeria

Author(s) & Year	Sector/ Context	Method/ Design	Key Findings	Mechanism or Limitation
<i>Amraoui et al.</i> (2024)	Healthcare (Biskra)	Quantitative (survey)	7.6% variance in organizational silence explained	Empowerment evident; limited by centralization
<i>Ghideri & Bousalem</i> (2023)	Higher Education	SEM PLS, Survey (n=76)	Reduced cynicism via civic virtue	University focused; limited scope
<i>Meziani et al.</i> (2025)	Education (Maghnia)	Quantitative	Improved decision making ($\beta = 0.346, p < .001$)	Motivational engagement; limited to secondary schools
<i>Amel</i> (2025)	Industry (CETIM)	Case study	ICT supported leadership boosted innovation	High internal validity; lacks scalability
<i>Benoumeldjadj & Bouchareb</i> (2022)	Local Governance	Mixed methods	Legal frameworks present, engagement weak	Centralized finance; low public awareness
<i>Nedjar</i> (2025)	Civil Society	Comparative case study	Civil society improves capacity, faces legal hurdles	Fragmented laws; political resistance
<i>Serir</i> (2022)	Legal Institutions	Institutional analysis	Identifies systemic centralization and weak civic culture	System level barriers to reform

Table 2: Summary of the key international studies that inform the Algerian context

Author(s) & Year	Country	Method	Key Findings	Mechanism or Limitation
<i>Fatoki</i> (2023)	South Africa	Quantitative (n=412)	28% increase in satisfaction; 62% mediated by empowerment	SME focused; strong mediation
<i>Gonçalves</i> (2014)	Brazil	Quantitative (municipal level analysis)	Participatory budgeting increased health and sanitation spending and reduced infant mortality rates	Improved public service delivery and social outcomes through citizen engagement in budget allocation
<i>Kovács</i> (2024)	Hungary	Qualitative multiple case study (3 municipalities)	Participatory budgeting improved transparency and civic trust	Demonstrates civic Demonstrates participative practices under centralized constraints
<i>Ochieng et al.</i> (2023)	Kenya	Quantitative	6.9% of performance variance explained	Strong productivity gains; cross sectional
<i>Miao & Zhang</i> (2023)	China	Moderated mediation	Voice behavior increased under participative leadership	Impact moderated by power distance
<i>Khattak et al.</i> (2023)	Pakistan	Quantitative	Strong link to citizenship behavior	Empowerment as key driver
<i>Sagnak</i> (2016)	Turkey	Quantitative	Motivation mediates participative leadership's impact	Context: school settings only
<i>Shonk</i> (2025)	Global	Conceptual	Inclusive leadership builds trust and commitment	Theoretical model; lacks empirical base

CONCLUSIONS

This review set out to examine how participative leadership is understood, practiced, and evaluated across key institutional sectors in Algeria. By drawing together studies from healthcare, education, industry, and local governance, the review highlights both the promise and the limitations of participative leadership in a system shaped by centralization and structural inertia. Although many studies point to clear benefits better communication, enhanced motivation, and increased innovation - these effects are often observed in isolated settings. What is still under researched are the deeper institutional and cultural factors that determine whether participative leadership takes root or remains a surface level practice.

The evidence suggests that participative leadership has transformative potential in Algerian institutions, particularly when grounded in shared decision making, psychological empowerment, and a culture of mutual trust. However, these principles cannot thrive in a vacuum. Centralized authority, low civic participation, and limited institutional autonomy continue to act as structural constraints. This means participative leadership must be viewed not only as a management technique, but as a component of broader institutional reform and democratic development.

Based on the sectoral patterns and theoretical insights explored throughout the review, I propose five strategic priorities for future research and practical development:

1. Develop and test hybrid leadership models

Algeria's governance context demands a flexible leadership framework that draws on participative, contingency based, and transformational approaches. Researchers should prioritize designing and empirically testing hybrid models across sectors and governance levels.

2. Explore the conditions that enable participation

Participation depends on more than leadership style. It relies on civic education, leadership training, digital tools, and trust in institutions. Future research should investigate how these factors support or limit participative practices.

3. Diversify research methodologies

Much of the current literature is based on cross-sectional data, which limits our understanding of how participative leadership evolves over time. Longitudinal studies, mixed method designs, and regional comparisons can offer deeper insights into its institutional life cycle.

4. Address the implementation gap

Although participative principles are written into Algerian policy, they often fail in practice. More research is needed on the legal, political, and administrative barriers that hinder implementation particularly at the municipal and civil society levels.

5. Link leadership to national reform efforts

Participative leadership should be part of wider strategies for decentralization, public sector renewal, and democratic development. Leadership programs especially in education, health, and administration need to reflect this broader vision.

To bring together these sectoral insights, *Table 3.* offers a summary of key findings, challenges, and strategic implications drawn from the Algerian literature reviewed in this paper.

Table 3: Sectoral Findings, Challenges, and Strategic Implications

Sector	Key Findings	Challenges / Limitations	Strategic Implications
Health-care	Participative leadership reduces organizational silence (<i>Amraoui et al., 2024</i>)	Centralized governance; weak institutional autonomy	Decentralize authority; engage frontline health workers in decision making
Education	Boosts motivation and decision quality (<i>Ghideri & Bousalem, 2023; Meziani et al., 2025</i>)	Focused on higher education; limited application elsewhere	Expand leadership programs to primary and secondary levels
Industry	Supports innovation and knowledge sharing (<i>Amel, 2025</i>)	Centralized management; weak leadership development structures	Institutionalize participative practices; link innovation grants to leadership behavior
Local Governance	Participation is formally supported but weak in practice (<i>Benoumeldjadj & Bouchareb, 2022; Serir, 2022; Gonçalves, 2014</i>)	Bureaucratic resistance; low public awareness; limited fiscal autonomy due to partial decentralization	Combine civic education with deeper fiscal and administrative devolution; strengthen local platforms; draw lessons from successful participatory budgeting in Brazil and emerging participatory practices in Hungary (<i>Kovács, 2024</i>)
Cross Sector	Psychological empowerment is a common mechanism; hybrid models are promising	Lack of empirical testing; sectoral fragmentation	Design, implement, and monitor hybrid models across institutions

In conclusion, participative leadership in Algeria represents both an opportunity and a responsibility. The opportunity lies in its potential to enhance institutional performance and rebuild trust through inclusive decision making. The responsibility, however, involves confronting the structural and cultural barriers that continue to limit its full realization.

This review contributes to both academic and policy discussions by clarifying the current state of research, identifying persisting gaps, and suggesting directions for future inquiry and leadership development. For participative leadership to thrive, Algeria will require not only capable and ethically grounded leaders but also institutional systems designed to support collaboration, accountability, and shared governance.

By situating participative leadership within Algeria's evolving governance and cultural context, this review advances theoretical understanding while offering actionable insights for institutional reform and leadership development in comparable emerging economies.

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UNDERSTANDING BANK PERFORMANCE IN REGIONAL ECONOMIES: A MIXED-METHODS INVESTIGATION OF FINANCIAL AND OPERATIONAL DRIVERS WITH IMPLICATIONS FOR SUSTAINABLE FINANCE

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ABSTRACT

This study examines the macroeconomic and internal drivers of bank profitability in the Ethiopian banking sector with the use of panel data from eight commercial banks from 2010 to 2023. Return on Assets (ROA) and Return on Equity (ROE) served as measures of performance, whereas explanatory variables included bank-specific determinants like loan to deposit ratio, bank size, loan growth, operating efficiency ratio, and capital adequacy ratio, along with macroeconomic determinants like GDP growth and interest rate. The analysis was conducted using STATA 17 with the random effects model being tested using the Hausman test. Results indicate that bank size and loan growth have a statistically significant and positive effect on ROA, highlighting that large banks could generate more earnings. On the other hand, the capital adequacy ratio was highly negatively associated with ROA and ROE, indicating the presence of a trade-off between profitability and financial safety. From the macroeconomic factors perspective, GDP growth has a positive effect on bank performance, while high interest rates have a negative impact on profitability by raising the costs of borrowing and reducing interest margins. Although the study attempted to integrate sustainable finance issues such as green lending, the lack of a regulatory framework and credible data within the Ethiopian banking sector made quantitative analysis impossible, revealing a fundamental gap in the financial system that necessitates urgent action to establish sustainable finance infrastructure. The study recommends that policymakers pursue regulatory reforms to enable ESG integration and promote sustainable banking practices, which can enhance profitability and align Ethiopia's financial sector with international standards and trends.

Keywords: bank profitability, sustainable finance, internal factors, macroeconomic, Ethiopia

JEL codes: G21, G32, Q01

INTRODUCTION

Banks play a fundamental function in socio-economic development by marshalling unused funds and directing them into productive investments, thus promoting economic growth and national development (Huang *et al.*, 2023; Zavadzka, 2018;

Schenke, 2021). Their core functions—accepting deposits and providing loans—not only stimulate economic activity but also make up a major portion of their operating earnings through lending (*Rajindra et al.*, 2021). Moreover, by efficiently helping capital flows to key sectors and infrastructure, banks contribute to economic stability and expansion. As *Čihák et al.*, (2012) emphasize, this is achieved through the effective distribution of excess and/or surplus funds to their most productive uses. In this context, bank profitability becomes a vital indicator of financial health and operational efficiency, enabling organizations to continue their intermediary function and development role (*Berger et al.*, 2020). Accordingly, understanding the drivers of bank profitability and sustainability is necessary for supporting enduring financial progress.

Given this context, this study targets to empirically analyse the key elements of bank profitability, integrating traditional economic and operational factors as well as sustainability-oriented variables. Specifically, the study examines Loan to Deposit Ratio (LD), Capital Adequacy Ratio (CAR), Bank Size (BS), Operational Efficiency Ratio (EFR), and Loan Growth (LG), alongside Green Lending and ESG principles. In this case, profitability is assessed through Return on Equity (ROE) and Return on Assets (ROA), offering a holistic view of how both financial strength and sustainability considerations shape bank performance.

Many studies (eg. *Isayas*, 2022; *Kohlscheen et al.*, 2018) conclude that bank success is influenced by a mixture of macroeconomic and bank-specific factors, including credit growth, interest rates, and exchange rates. However, much of the existing literature primarily focuses on macroeconomic determinants and only a few bankspecific factors while failing to comprehensively address key financial and operational factors such as bank size and efficiency. Moreover, sustainability-related determinants, including green lending practices and ESG performance, remain largely overlooked, despite their growing recognition as key drivers of long-term bank profitability in the changing financial environment. Previous research like (*Tibebe & Gujral*, 2022; *Torre Olmo et al.*, 2021) has primarily measured bank performance using Return on Assets (ROA) or Return on Equity (ROE) as standalone metrics, neglecting a more holistic approach that integrates both traditional profitability drivers and sustainability-linked variables. The absence of a thorough examination of the microeconomic and sustainability-related determinants of bank profitability in Ethiopia presents a critical gap in the literature. In particular, understanding how sustainable finance practices, such as ESG-based risk assessments and green credit policies, impact financial performance is essential for promoting both economic growth and sustainability. However, research on sustainable finance in Ethiopia remains minuscule, highlighting the need for further empirical investigation. This study aims to solve these limitations by examining both conventional financial and operational efficiency-related microeconomic determinants, alongside sustainability-linked factors, in influencing bank profitability in Ethiopia.

Understanding the key drivers of bank profitability is important for financial institutions, regulators, and policymakers in fostering a resilient and efficient banking system. This study contributes to the empirical analysis of bank profitability by examining financial, operational, and sustainable finance-related factors, with a particular focus on the Ethiopian banking sector.

Review of related literature

The performance of banks, often weighed through metrics like Return on Assets (ROA), and Return on Equity (ROE), is shaped by both bank-specific and external macroeconomic factors (Horobet *et al.*, 2021; Lamothe *et al.*, 2024; Abate & Kaur, 2023; Rehman *et al.*, 2018; Yuan *et al.*, 2022). Internal factors, shaped by management decisions, encompass efficiency, risk management, and resource allocation.

Capital adequacy is another critical internal factor ensuring financial stability and resilience, as well-financed banks are better placed to endure economic shocks and sustain profitability (Olawale, 2024; Kohlscheen *et al.*, 2018). This underscores the link between traditional profitability metrics and sustainable finance principles, which enhance strength and long-term value creation (Patel *et al.*, 2022). Empirical studies highlight the association between capital adequacy ratio (CAR), credit risk, operational efficiency, loan growth, and bank size in influencing profitability (Anantiputeri *et al.*, 2023; Christaria & Kurnia, 2016; Gautam, 2019). For instance, a higher CAR is positively correlated with profitability, reinforcing the importance of robust capital buffers for financial stability (Dietrich & Wanzenried, 2014). Additionally, bank-specific factors like non-interest income and capital ratios significantly affect ROA (Al-Harbi, 2019).

External factors, including GDP growth, inflation, exchange rates, and interest rates, also play a fundamental role in bank performance (Yuan *et al.*, 2022). Several studies emphasize that bank profitability is shaped by a combination of bank-specific, industry-specific, and external elements (Busch *et al.*, 2021; Friede *et al.*, 2015; O'Connell, 2023). Among internal determinants, capital adequacy, operational efficiency, and asset quality play a crucial role, as they indicate a bank's ability to manage costs, generate sustainable income, and withstand financial shocks (Athanasoglou *et al.*, 2008; Dietrich & Wanzenried, 2011).

These days, integrating sustainability considerations into financial decision-making has gained significant attention due to its implications for long-term stability and performance (Haessler, 2020). Banks that incorporate ESG factors into their lending and investment strategies tend to experience improved financial stability and risk-adjusted returns (Gangi *et al.*, 2019; Liu & Xie, 2024; Voicu Dan *et al.*, 2022). Awareness of the importance of sustainability issues is crucial for maintaining business interests: sustainability is not only important for the environment, but also for the economy and society (Ahmad *et al.*, 2023). As for the financial industry, and especially the banking industry, it performs a key role in promoting sustainability practices within companies (Andaiyani *et al.*, 2023). As one of the key pillars of the financial industry, the banking sector has great potential to support ESG (environmental, social and governance) practices within companies, which is an important step towards sustainable development (Andrieş & Sprincean, 2023). Sustainability issues that may affect a company's financial performance have only recently been empirically investigated and are still being debated (van Bommel, 2023).

However, despite its growing importance, research on sustainable finance in Ethiopia remains limited, particularly in understanding its impact on bank profitability. Previous studies have primarily measured bank performance using standalone metrics like Return on Assets (ROA) and Return on Equity (ROE), without a comprehensive

exploration of the microeconomic and sustainability-linked determinants of profitability (Lelissa, 2014; Tibebe & Gujral, 2018; Torre Olmo et al., 2021). This leaves a critical gap in assessing how ESG-based risk assessments, green credit policies, and other sustainable finance practices influence bank performance.

To bridge these gaps, this study undertakes an analysis by investigating both traditional financial determinants and sustainability-related factors affecting banking profitability in Ethiopia. Additionally, it integrates some information on sustainable finance principles to evaluate how profitability aligns with long-term ESG objectives, providing a more thorough perception of the evolving role of sustainability in the economic sector.

Based on the preceding literature review and the objectives of this study, the following hypotheses are proposed for testing:

- H1:* The Capital Adequacy Ratio has a significant positive impact on Return on Equity (ROE).
- H2:* Bank Size is positively associated with profitability metrics (ROA and ROE), considering the role of sustainable investment portfolios.
- H3:* Loan Growth has a statistically significant impact on ROA and ROE, and this growth can be directed toward sustainable economic activities.
- H4:* Operational Efficiency, measured by the cost-to-income ratio, significantly affects bank profitability.
- H5:* Loan-to-deposit ratio (LTD) has a significant impact on bank profitability (ROA and ROE).
- H6:* Green Lending contributes positively to bank profitability, and banks strategically balance financial performance with sustainability objectives when allocating credit to environmentally friendly projects.
- H7:* GDP growth rate (GDPGR) has a significant impact on bank profitability (ROA and ROE).

MATERIALS AND METHODS

The main aim of this article is to analyse the determinants of financial performance of commercial banks in Ethiopia, incorporating some ideas and findings of sustainable finance into its discussion. It seeks to identify and understand the effect driven by a specific cause relationship between performance indicators and bank profitability, emphasizing how responsible management of these variables can contribute to both financial profitability and sustainability objectives.

The research methodology aligns with the general and specific objectives of the study, employing random effect regression analysis to quantify the influence of the determinants on the dependent variables, Return on Assets (ROA) and Return on Equity (ROE). Both quantitative and qualitative approaches are utilized to investigate the effects of variables like Loan to deposit ratio, Bank Size, Loan Growth, Operational Efficiency, Capital Adequacy, GDP growth, and Inflation rate, on the financial performance of Ethiopian commercial banks.

Additionally, this study integrates sustainable finance considerations by examining how responsible lending practices can enhance profitability. This perspective aims to

provide actionable insights for policymakers and practitioners to balance profitability with sustainability in the banking sector.

A non-probabilistic purposive sampling method is employed to select a sample of nine commercial banks from the 44 operating commercial banks in Ethiopia. The selection criteria included a focus on banks with a tenure of 10 years and above in the industry. The chosen sample banks comprise Awash Bank, Bank of Abyssinia, Commercial Bank of Ethiopia (a state – owned bank), Cooperative Bank of Oromiya, Dashen Bank, Hibret Bank, Lion International Bank, Nib International Bank, and Wegagen Bank. The study primarily relies on secondary data gathered from the selected banks' websites, focusing on the analysis of annual reports spanning the years 2010 to 2023. The research employs various statistical methods, including multiple regression modeling, descriptive statistics, multicollinearity tests and other diagnostic tests.

Model specification

To examine the influence of internal bank factors' profitability determinants on the performance of commercial banks in Ethiopia from 2010 to 2023 using an econometric approach, the following panel data regression equation is formulated to explain the influence of each factor on the financial performance of Ethiopian commercial banks.

$$Y_{it} = \beta_0 + \beta_1 X_{1it} + \beta_2 X_{2it} + \dots + \beta_k X_{kit} + \varepsilon_{it} \quad (1)$$

Where:

- Subscript i denotes the cross-sectional dimension (firms). Subscript t refers to the time-series dimension (year).
- Y_{it} represents the dependent variable. β_0 is the intercept (constant) term. β_k is the parameter to be estimated for the explanatory variables.
- X_{kit} represents the observations on the determinant factors for $k = 1, N$ and $t = 1, \dots, T$, $i = 1, \dots, N$.

Hence, the comprehensive models that encompass all variables to examine the correlation between independent variables and dependent variables (ROA and ROE) are provided below:

Model₁

$$ROA_{i,t} = \beta_0 + \beta_1 LD_{i,t} + \beta_2 BSZ_{i,t} + \beta_3 LG_{i,t} + \beta_4 CAR_{i,t} + \beta_5 OER_{i,t} + \beta_6 GDPGR_{i,t} + \beta_7 INTRATE + \varepsilon_{i,t} \quad (2)$$

Model₂

$$ROE_{i,t} = \beta_0 + \beta_1 LD_{i,t} + \beta_2 BSZ_{i,t} + \beta_3 LG_{i,t} + \beta_4 CAR_{i,t} + \beta_5 OER_{i,t} + \beta_6 GDPGR_{i,t} + \beta_7 INTRATE + \varepsilon_{i,t} \quad (3)$$

Where:

- $ROA_{i,t}$ = Return On Assets of i^{th} bank at year t
- $ROE_{i,t}$ = Return on Equity of i^{th} bank at year t
- $\beta_1 NPL_{i,t}$ = Non-Performing Loan Ratio of i^{th} bank at year t
- $\beta_2 BSZ_{i,t}$ = Bank Size of i^{th} bank at year t
- $\beta_3 LG_{i,t}$ = Loan Growth Rate of i^{th} bank at year t
- $\beta_4 CAR_{i,t}$ = Capital Adequacy Ratio of i^{th} bank at year t

- $\beta_5 \text{OER}_{i,t}$ = Operating Efficiency Ratio of the i^{th} bank at year t
- $\beta_6 \text{GDPGR}_t$ = Gross Domestic Product Growth Rate of Ethiopia at year t
- $\beta_7 \text{INTRATE}$ = Lending Interest Rate of Ethiopian Banks at year t
- $\varepsilon_{i,t}$ = Error Term Capturing Unobserved Effects

RESULTS AND DISCUSSION

As shown in *Table 1* below, on average, the banks in the study had a quite stable return on assets (ROA) of 2.8%, with a small variation in profitability from 1% to 5.2%. The 0.799 value of the loan-to-deposit ratio (LD) indicates that banks lend out about 80% of their deposits, although loan amounts vary among banks. Banks in the study were comparable in terms of their total assets, as evidenced by the mean value of 11.9 for the bank size variable in the summary statistics. Loan growth (LG) and bank efficiencies varied significantly, with banks expanding their loan portfolios by an average of 35.5% and exhibiting efficiency ratios ranging between 40.3% and 89.6%, respectively, indicating differences in risk, growth strategies, and operational efficiency.

Capital soundness or capital adequacy, as shown by the capital adequacy ratio (CAR) of 12%, is generally considered as a sign of financial stability and sound capital compared to the standard CAR level of 8%. Economic conditions were reasonably stable, with the GDP growth rate (GDPGR) averaging 8.6% and the interest rate (INTRATE) maintaining an average of 13%.

Overall, the descriptive statistics indicate a stable banking ecosystem with some fluctuations in certain variables like loan growth and efficiency, indicating variances in banks' strategies and risk management. These results provide ground for understanding the causes that influence the profitability of banks in Ethiopia, which will be further analyzed in the following sections of the article.

Table 1: Descriptive statistics of variables under study.

Variable	Obs	Mean	Std. Dev.	Min	Max
ROE	112	0.201	0.054	0.112	0.366
ROA	112	0.028	0.009	0.010	0.052
LD	112	0.799	0.088	0.600	0.969
lnBS	112	11.9	0.535	10.517	13.07
LG	112	0.355	0.124	0.202	0.722
EFR	112	0.551	0.100	0.403	0.896
CAR	112	0.120	0.016	0.070	0.149
GDPGR	112	0.086	0.017	0.061	0.114
INTRATE	112	0.130	0.011	0.119	0.150

Pairwise correlation analysis and multicollinearity diagnosis

From *Table 2*, we can observe that the ROE values in the sample range from 5.4% to 36.6%, with an average of 20.1%. The median ROE is 11.2%, which is lower than the mean, suggesting a right-skewed distribution where a few high-performing banks may be pulling the average upward. This spread indicates considerable variation in

profitability across the sampled banks, possibly reflecting differences in management efficiency, capital structure, or risk exposure.

The test was conducted to examine pairwise correlation to see the relationships between the most crucial variables: Return on Assets (ROA), Loan to Deposit Ratio (LD), Bank Size (lnBS), Loan Growth (LG), Efficiency Ratio (EFR), Capital Adequacy Ratio (CAR), GDP Growth (GDPGR), and Interest Rate (INTRATE).

The results show that ROA is negatively related to LD (-0.035) and BS (-0.055), while it is positively related to LG (0.205) and GDPGR (0.265). Conversely, ROA is negatively related to EFR (-0.282), CAR (-0.483), and INTRATE (-0.245), which shows that higher capital adequacy, operational inefficiency and rising lending interest are associated with declining profitability.

The LD ratio has low correlations with the other variables, indicating low direct relations in the model.

Bank Size (BS) is positively and moderately correlated with EFR (0.408) and INTRATE (0.388), which means that larger banks have greater costs of operations and are more sensitive to changes in interest rates. However, BS is highly negatively correlated with GDPGR (-0.683), which suggests that large banks do not always benefit when the economy expands.

Loan Growth (LG) is weakly positively related to BS (0.073) and EFR (0.078) but negatively related to CAR (-0.139) and GDPGR (-0.281) and therefore has conflicting implications for macroeconomic performance and growth policies.

Efficiency Ratio (EFR) is weakly positively related to INTRATE (0.480), but negatively related to GDPGR (-0.441), and thus suggests that with improved economic performance and increased interest rates, efficiency in operations has the potential to decline.

Capital Adequacy Ratio (CAR) is always inversely related to other variables, most notably to ROE (-0.483) and BS (-0.243), such that more capitalized banks can be less profitable and of smaller size.

GDP Growth (GDPGR) reflects high inverse relations with BS (-0.683) and INTRATE (-0.691), and moderate inverse relations with LG (-0.281) and EFR (-0.441), underlining the relation between macroeconomic performance and bank performance.

Finally, INTRATE is positively correlated with BS (0.388) and EFR (0.480), but inversely correlated with GDPGR (-0.691) and CAR (-0.128), which means that increased interest rates are associated with larger bank size and reduced economic growth.

In general, the correlation matrix suggests strong correlations among financial, operating, and macroeconomic variables, which potentially have implications for bank performance and strategy.

With respect to multicollinearity problems, all independent variables apart from Bank Size possess low Variance Inflation Factor (VIF) values, suggesting few multicollinearity problems. VIF test results suggest that Loan to Deposit Ratio (1.02), Efficiency Ratio (1.21), Capital Adequacy Ratio (1.35), GDP Growth Rate (1.29), and Interest Rate (2.79) are considerably lower than the generally accepted level of 5, suggesting that none of the variables have a multicollinearity problem. However, Bank Size shows a relatively larger

VIF of 4.16, but still within limits. Being below the critical value of 10 for any of the variables, overall, multicollinearity is not a concern for the model.

Table 2: Correlation and multicollinearity diagnosis

Variable	ROE	ROA	LD	BS	LG	EFR	CAR	GDPGR	INTRATE
ROE	1.00								
ROA	0.89	1.00							
LD	0.05	-0.04	1.00						
lnBS	-0.07	-0.06	-0.02	1.00					
LG	0.24	0.21	0.01	0.07	1.00				
EFR	-0.18	-0.28	0.05	0.41	0.08	1.00			
CAR	-0.45	-0.48	-0.04	-0.24	-0.14	-0.05	1.00		
GDPGR	0.24	0.26	-0.05	-0.68	-0.28	-0.44	-0.07	1.00	
INTRATE	-0.24	-0.25	-0.03	0.84	0.07	0.48	-0.13	-0.69	1.00
Multicollinearity Diagnostics:									
VIF			1.02	4.16	1.21	1.35	1.29	2.79	3.94

Model estimation, assumptions and diagnostics

In this part, some tests of model assumptions and model fit diagnostics are conducted and presented as follows.

Table 3: Model estimation

Model	Random Effect (RE)		Fixed Effect (FE)	
Variables	ROE	ROA	ROE	ROA
LD	0.00651 (0.0483)	-0.00368 (0.00727)	-0.00640 (0.0497)	-0.00704 (0.00760)
BS	0.0293 (0.0182)	0.00592** (0.00240)	0.0194 (0.0243)	0.00132 (0.00371)
LG	0.0901** (0.0385)	0.0147*** (0.00559)	0.0644** (0.0424)	0.0124* (0.00648)
EFR	-0.0396 (0.0499)	-0.0166** (0.00735)	-0.0465 (0.0533)	-0.0166** (0.00814)
CAR	-1.167*** (0.308)	-0.221*** (0.0450)	-0.910*** (0.338)	-0.166*** (0.0517)
GDPGR	0.544 (0.402)	0.0921 (0.0623)	0.453 (0.402)	0.0693 (0.0614)
INTRATE	-1.959** (0.825)	-0.320*** (0.116)	-1.550** (1.016)	-0.142 (0.155)
_CONS	0.185 (0.206)	0.0244 (0.0308)	0.250 (0.227)	0.0548 (0.0347)
Wald Chi2	42.75	77.73	-	-
Prob>F	0.000	0.0000	-	-
F-Statistics	-	-	3.55	5.31
Prob>F	-	-	0.0019	0.0000

Specification test for models (Hausman Test for RE against FE)

As shown in *Table 4*, a Random Effects (RE) panel regression model was estimated to examine the determinants of bank profitability. The choice between Fixed Effects and Random Effects models was examined by applying the Hausman test, which yielded a p-value of 0.8326 and 0.117 for ROE and ROA, respectively, supporting the suitability of the Random Effects specification.

Table 4: Hausman test results

	ROE	ROA
Chi2 (7)	3.52	11.52
Prob > chi2	0.8326	0.1173
Model Chosen	Random Effect	Random Effect

Furthermore, as shown in *Tables 5 and 6*, diagnostic tests were conducted to validate key regression assumptions. The manual Wooldridge test for autocorrelation in *Table 6* confirmed the presence of first-order autocorrelation (coefficient = 0.2184; $p = 0.018$). Additionally, the Breusch–Pagan/Cook–Weisberg test for heteroskedasticity in *Table 7* indicated significant heteroskedasticity in both ROA ($\chi^2 = 11.59$; $p = 0.0007$) and ROE ($\chi^2 = 3.38$; $p = 0.0330$) models.

Regarding normality of errors, although the residuals showed no significant skewness, the kurtosis component of the normality test was significant, suggesting serious tails than a normal distribution. Given the sample size, this mild deviation is unlikely to severely impact the reliability of the regression estimates, and robust standard errors have been used to ensure valid inference (*Table 8 and Table 9*).

Table 5: Skewness and Kurtosis tests for normality

Variable	Observation	Prob (Skewness)	Prob (Kurtosis)	Adj.	Prob>Chi2
Residuals	112	0.092	0.0311	6.92	0.0315

Table 6: Autocorrelation test

Method	Variables	Coefficient	P – Value	Result
Manual Wooldridge test	Uhat _lag	0.2184	0.018	Autocorrelation
	_Cons	-0.00018	0.758	

Table 7: Breusch–Pagan/Cook–Weisberg test for Heteroskedasticity

	Fitted Values for ROE	Fitted Values for ROA
chi ² (1)	3.38	11.59
Prob > chi ²	0.0330	0.0007

Table 8: Random effects regression (Robust standard errors for ROA)

ROA	Coef.	St.Err.	Sig
LD	-0.004	(0.007)	
lnBS	0.006	(0.002)	**
LG	0.015	(0.006)	**
EFR	-0.017	(0.007)	
CAR	-0.221	(0.045)	***
GDPGR	0.092	(0.062)	**
INTRATE	-0.320	(0.116)	***
Constant	0.024	0.031)	

Robust standard errors are in parentheses. $p < 0.01$ (***), $p < 0.05$ (**), $p < 0.1$ (*).

Table 9: Random effects regression (Robust standard errors for ROE)

ROE	Coef.	St.Err.	Sig
LD	0.007	(0.030)	
lnBS	0.029	(0.019)	
LG	0.090	(0.052)	*
EFR	-0.040	(0.097)	
CAR	-1.167	(0.421)	***
GDPGR	0.544	(0.240)	**
INTRATE	-1.960	(0.776)	**
Constant	0.185	(0.249)	

Robust standard errors are in parentheses. $p < 0.01$ (***), $p < 0.05$ (**), $p < 0.1$ (*).

The bank-related internal variables studied, including loan-to-deposit ratio (LD), bank size (lnBS), loan growth (LG), efficiency ratio (EFR), and capital adequacy ratio (CAR), have mixed impacts on profitability. Bank size and loan growth contribute positively and significantly to ROA (p – values of 0.022 and 0.048, respectively), meaning that large banks and loan book-growing banks have better asset utilization and income generation. This is aligned with the findings of (Blatter & Fuster, 2022; Grzeta et al., 2023), who captured such benefits of economies of scale and increased loans. However, other studies have reported contrasting results, indicating that bank size negatively and significantly affects financial performance, with larger banks tending to underperform (Asongu & Odhiambo, 2019; Blatter & Fuster, 2022; Ojeyinka & Akinlo, 2021). The positive impacts of loan growth also contradict other studies like (Vithessonthi, 2023), who found that loan growth can have adverse effects on financial performance, particularly when banks fail to properly assess and manage the associated credit risk. Vithessonthi's study emphasized that aggressive loan growth could contribute to a higher level of non-performing loans (NPLs) and lower profitability, especially during periods of economic downturn or financial instability.

As shown in the regression summary, both LD ratio and efficiency ratio were observed to have statistically non-significant associations with ROA and ROE (p – values of 0.598 and 0.829, respectively), indicating that such liquidity and operating

determinants may not necessarily determine profitability in the Ethiopian context. This is consistent with (Suroso, 2022), who captured the potential risk of a high LD ratio but found its effect on profitability to be inconclusive. The CAR, however, indicated a strong negative correlation with both ROA and ROE (p - values of 0.00 and 0.006, respectively), indicating that while regulatory capital increases stability, it comes at the cost of reduced income potential. While this is supported by (Balami & Chalise, 2023; Silaban, 2017), who assumed that big capital cushions can reduce leverage and returns, the negative association between CAR and performance is not universally accepted. Several studies provide contrasting evidence, suggesting that strong capitalization enhances profitability by improving a bank's risk profile and investor confidence. For example, (Bitar et al., 2018; Spaseska et al., 2022; Sunaryo, 2020) all report a positive and significant impact of CAR on bank performance measured by ROA and ROE. Their findings emphasize that banks maintaining robust capital buffers are more capable of enduring market volatility, attracting funding at favorable rates, and expanding lending activities more securely, thereby improving their overall profitability.

Coming to macroeconomic variables, GDP growth (GDPGR) and interest rate (INTRATE) both contributed sizably to bank performance. GDP growth contributed sizably and positively to ROA and ROE (p – values of 0.028 and 0.023), indicating that a growing economy increases bank profits through increased lending possibilities and money movement. This finding is consistent with (Bikker, 2004), who emphasized the importance of economic cycles to the profitability of the bank, and (Vong & Chan, 2006), who proved GDP growth improves performance in the banking industry of Asian economies. In contrast, interest rates at a high level displayed negative and high correlation with profitability, as they were associated with diminished ROA and ROE (p = 0.006 and p = 0.012, respectively). The above supports (Dietrich & Wanzenried, 2011), who highlighted the detrimental role of high interest rates for banks' net interest margins. However, it goes against (Claessens et al., 2018), who argue that higher rates are sometimes in the best interests of banks, particularly where liabilities are repriced before assets. The converse evidence between contexts supports the necessity for country-specific evaluations when determining macro-financial linkages.

To conclude, the findings of this research corroborate that the internal and external determinants all significantly affect Ethiopian commercial banks' financial performance, although with different signs and magnitudes. Internal factors like bank size and loan extension have a positive effect on profitability, whereas excess capital (CAR) appears to constrain returns. Macroeconomic wise, growth in the economy enhances profitability, whereas rising interest rates dampen it. These findings support and contradict elements of existing literature, showing that although certain dynamics are universally apparent, their specific effects depend on institutional context, market structure, and regulatory regimes.

In *Table 10*, Summary of Hypotheses, Test Results, and Decisions is presented to enable readers to instantly and easily identify which hypotheses were accepted, which were rejected, and which could not be tested.

Thus, the study highlights the importance for policymakers and bank managers of adjusting policies that balance internal operational efficiency with external economic realities, as well as carrying out additional studies on emerging drivers like sustainable finance, which is understudied due to the lack of data in Ethiopia.

Table 10: Summary of Hypotheses, Test Results, and Decisions

Hypothesis	Description	Test Result	Accept/Reject Decision
H1	CAR has a significant positive impact on ROE	Negative and significant	Rejected
H2	Bank size is positively associated with ROA and ROE	Positive on ROA (significant), ROE (not significant)	Partially supported
H3	Loan growth has a significant impact on ROA and ROE, and can support sustainability	Positive and significant for both	Accepted
H4	Operational efficiency significantly affects profitability	Significant negative impact on ROA	Accepted
H5	Loan-to-deposit ratio significantly affects profitability	Not significant	Rejected
H6	Green lending positively affects profitability and sustainability	Not tested (due to lack of data)	NA
H7	GDP growth rate significantly affects profitability	Positive but not statistically significant	Rejected

Despite the initial desire to incorporate sustainable finance-related variables in the empirical study, this study was largely limited since there was no credible and quantifiable data available in the Ethiopian banking industry. This drawback is primarily due to the absence of an official regulatory framework and uniform reporting methods for sustainable finance activities in the country, which is also mentioned by (Fufa, 2024). Therefore, a quantitative examination of the impact of sustainable finance—such as green lending—on bank profitability was not possible.

Nonetheless, this limitation reveals a fundamental gap in the Ethiopian financial system, particularly as international banking standards are increasingly inclined towards considering environmental, social, and governance (ESG) aspects. The integration of sustainable finance metrics is not only desirable but also mandatory to achieve long-term financial well-being, effective risk management, and inclusive economic development (Cantero-Saiz *et al.*, 2024). Therefore, even if empirical testing could not be carried out within the scope of this study, the findings strongly demand the imperative establishment of regulatory frameworks and institutional data infrastructures to enable subsequent research and implementation of sustainable finance in Ethiopia.

Other evidence demonstrates the actual benefits of sustainable finance instruments such as green lending. For example, (Sutrisno *et al.*, 2024) found that UAE banks that

offered greater credit to environmentally friendly projects recorded lower non-performing loan (NPL) ratios, which indicated better credit quality and lower risk exposure. In China, (Danye, 2020) reported that banks that extended green credit products not only enhanced their bottom line but also improved their public image, thereby indicating the twin advantage of profitability and corporate social responsibility. These international outcomes provide a compelling basis for Ethiopian decision-makers and financiers to support sustainable finance as a strategic thrust.

CONCLUSION

This study examined both internal and macroeconomic variables affecting the performance of banks in Ethiopia, revealing distinct patterns that offer practical insights for the banking sector. Among the internal factors, bank size and loan growth exhibited positive and statistically significant effects on profitability, as measured by return on assets (ROA). This suggests that larger banks and those expanding their loan portfolios are better positioned to utilize their assets effectively and generate income. However, the capital adequacy ratio (CAR) was found to have a strong negative association with both ROA and return on equity (ROE), indicating that holding excess capital, while beneficial for regulatory compliance and stability, may limit income-generating capacity. The loan-to-deposit ratio and efficiency ratio, by contrast, showed no statistically significant impact, implying that, within the Ethiopian context, these metrics may not be primary drivers of bank performance.

From a macroeconomic perspective, GDP growth positively influenced profitability, reinforcing the view that broader economic expansion creates favorable conditions for banks through increased financial activity, lending opportunities, and customer engagement. On the other hand, rising interest rates were associated with a significant decline in profitability, suggesting that higher borrowing costs may reduce demand for loans and compress net interest margins. These contrasting effects highlight the importance of aligning monetary policy and banking strategies with prevailing economic conditions to maintain sustainable performance.

While this research endeavored to investigate the role of sustainable finance, such as green lending, in influencing bank profitability, it faced significant data limitations. The absence of a formal regulatory framework and standardized reporting for ESG-related banking practices in Ethiopia meant that these variables could not be quantitatively analyzed. Nonetheless, this limitation brings to light a pressing institutional gap. As global financial systems increasingly integrate environmental and social considerations, Ethiopia's financial sector must also move in this direction. Sustainable finance holds clear potential to enhance profitability, improve risk management, and promote inclusive growth. The inability to measure these effects quantitatively in this study should be seen as a call to action for regulators and institutions to establish the necessary infrastructure to support future research and practice in this area. In doing so, Ethiopian banks can position themselves to benefit from emerging global trends and contribute to long-term national development goals.

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AI-DRIVEN INDUSTRY 4.0: ENHANCING AUDITING, CORPORATE GOVERNANCE, AND FINANCIAL PERFORMANCE

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ABSTRACT

Industry 4.0, driven by artificial intelligence and digital technologies, has rapidly transformed corporate auditing, governance, and overall firm performance. This paper explores how AI-driven Industry 4.0 influences audit efficiency, enhances corporate governance, and improves business performance. By leveraging AI, blockchain technology, big data analytics, and automation, organizations can improve risk assessment, optimize processes, and support better decision-making. These technologies enhance accountability and control efficiency while improving fraud detection, ensuring data privacy, and reducing auditing costs. The study further examines how Industry 4.0 reshapes corporate governance by requiring digitally competent directors, more active shareholder participation, and redefined board roles. Moreover, Industry 4.0-related innovations, such as machine learning and the Internet of Things (IoT), contribute to competitive advantage, market expansion, and financial performance through process optimization, supply chain integration, and enhanced customer experiences. This study is based on a conceptual and integrative literature review, synthesizing existing research to develop a comprehensive understanding of the relationship between Industry 4.0, auditing, governance, and firm performance. The findings highlight the critical role of AI in shaping corporate auditing, governance, and financial sustainability, providing valuable insights for policymakers, business leaders, and auditors navigating digital transformation.

Keywords: Industry 4.0, artificial intelligence, accounting practices, corporate governance, performance efficiency

JEL codes: M41, G34, O33

INTRODUCTION

The rapid development of digital technologies has fundamentally transformed modern economic and industrial systems. In recent years, the concept of Industry 4.0 has emerged as a key paradigm describing the integration of advanced technologies such as artificial intelligence (AI), big data analytics, the Internet of Things (IoT), and cyber-physical systems into industrial and organizational processes. These technologies enable real-time data processing, automation, and intelligent

decision-making, thereby reshaping the way organizations operate, monitor performance, and manage risks (Schwab, 2016; Jeschke et al., 2017).

In business and economic contexts, AI-driven Industry 4.0 has significantly reshaped firm strategies, auditing practices, supply chains, financial performance, governance mechanisms, and stakeholder relationships (Morrar et al., 2017). These transformations generate both new opportunities and risks, requiring more effective supervisory boards and regulatory systems (Chen, 2021; Liao et al., 2017; Ahmed et al., 2023). The increasing use of digital technologies in accounting has its roots in early computerized data processing. For instance, General Electric became one of the first companies to implement electronic accounting systems in 1954; however, only a limited number of professionals initially possessed the necessary technical skills (Senft et al., 2012).

Artificial intelligence is increasingly and, in some cases, replacing traditional auditing methods by improving efficiency, accuracy, and the ability to extract valuable insights from large datasets (Iwuanyanwu et al., 2023; Erhan et al., 2021; Wilson and Sangster, 1992). As the global economy shifts toward a digital and knowledge-based model, technological advancements are reshaping professional roles and organizational processes.

Accounting, auditing, and controlling functions increasingly rely on technological solutions due to their speed, reliability, and precision (Nwachukwu et al., 2021). Moreover, automation and digitization are transforming auditing procedures by enhancing identification and strengthening, while also introducing new ethical and legal challenges. As business performance becomes increasingly influenced by AI-driven decision-making, governance structures must evolve to ensure transparency, compliance, and responsibility.

This study presents a conceptual and integrative review of the existing literature. Its primary objective is to examine how AI-driven Industry 4.0 influences auditing practices, corporate governance, and financial performance. Although prior studies have explored these areas, they are often fragmented and analysed independently, with limited attention to their interrelationships. Therefore, this study addresses a research gap by providing an integrated framework that explains the connections between digital technologies, auditing efficiency, governance effectiveness, and financial outcomes. By synthesizing existing research, the study contributes to a deeper understanding of how Industry 4.0 technologies can support more efficient auditing systems, stronger governance mechanisms, and improved financial performance. The findings offer practical implications for auditors, corporate managers, and policymakers navigating digital transformation.

RELEVANT LITERATURE

Technological advancements have significantly transformed accounting and auditing practices since the introduction of computers into the profession (Collier, 1984). In particular, the Fourth Industrial Revolution has accelerated the digitalization of auditing processes, driven by the rapid growth in data volume, evolving business strategies, and the increasing demand for continuous and real-time auditing. As a

result, auditors are required to develop strong digital competencies in order to deliver high-quality audit services (*Oladejo and Alao, 2019*).

According to *Akhter and Sultana (2018)*, accounting and controlling functions are expected to become increasingly automated in the future. While information technologies significantly reshape traditional accounting practices and increase the demand for highly skilled professionals, they are unlikely to fully replace human capabilities such as critical thinking and emotional intelligence. Therefore, the role of accountants is evolving rather than disappearing, requiring adaptation to new technological environments (*Dai, 2017*).

Recent studies highlight the growing role of artificial intelligence in transforming auditing practices. AI enables the automation of repetitive tasks, enhances risk assessment, and provides real-time insights, thereby improving audit efficiency and effectiveness (*Inuanyanwu et al., 2023*). Similarly, *Juhandi et al. (2020)* demonstrate that digital monitoring systems can support fraud detection and error identification within organizations. Furthermore, *Wang & Gang (2018)* show that AI-based language processing techniques can analyse unstructured data, such as emails and documents, to identify potential risks and compliance issues. The application of machine learning and real-time data analytics has also expanded significantly in accounting and controlling, contributing to improved forecasting, data analysis, and decision-making processes (*Nwachukwu et al., 2021*). As a result, digital technologies have a stronger impact on audit planning and control systems compared to traditional manual approaches.

In addition, prior research emphasizes the importance of data-driven models in predicting financial distress. Analytical methods supported by artificial intelligence are often more effective than traditional statistical approaches in forecasting financial failure and supporting decision-making for stakeholders such as auditors, managers, and investors (*Salehi et al., 2016; Chen & Du, 2009; Hågen & Kondorosi, 2009*).

Despite the significant benefits of Industry 4.0 and AI, several studies report mixed or conditional outcomes. For instance, high implementation costs, lack of skilled personnel, data integration challenges, and cybersecurity risks can limit the adoption of these technologies, particularly in developing economies (*Alshabrani, 2023*). Moreover, some studies suggest that AI investments may negatively affect firm value or stock market performance under certain conditions (*Lui et al., 2022*), while others identify potential negative relationships between Industry 4.0 adoption and supply chain performance (*Malik & Pasha, 2022*). These findings suggest that the impact of Industry 4.0 is highly context-dependent and influenced by organizational capabilities, industry characteristics, and the level of digital maturity.

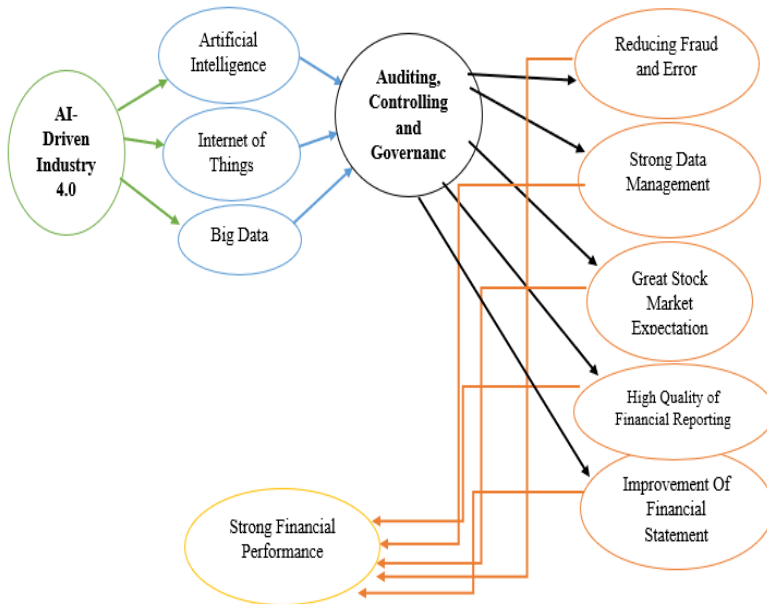
FRAMEWORK OF INDUSTRY 4.0 IN ACCOUNTING PRACTICES

In recent years, Industry 4.0 has emerged as a key technological paradigm with a significant impact on organizational efficiency and sustainable firm performance (*Luthra & Mangla, 2018*). These technologies address contemporary challenges such as increasing demand for product customization, market volatility, global competition, and shorter product life cycles (*Kiel et al., 2017*). Industry 4.0 enables

greater production flexibility, reduced time to market, and more efficient resource utilization, while also creating new business opportunities (Waibel *et al.*, 2017). In this context, firms can achieve long-term sustainability by integrating economic, social, and environmental objectives, commonly referred to as the triple bottom line. The adoption of Industry 4.0 technologies can support this integration by enhancing operational efficiency and enabling more sustainable business practices across different organizational processes (Bhagat *et al.*, 2022).

The figure below (Figure 1) illustrates the interrelationships among key technological developments within the context of the Fourth Industrial Revolution, driven by artificial intelligence. It highlights how these technologies influence auditing, controlling, governance, and overall organizational efficiency. The core function of “Auditing and Governance” is supported by three major technological components: big data, the Internet of Things (IoT), and artificial intelligence (AI). These technologies enable automated anomaly detection, real-time monitoring, and more accurate data analysis, thereby enhancing traditional audit procedures. The benefits resulting from the effective application of these technologies are represented around this central function. In particular, the reduction of fraud and error is achieved through AI’s ability to identify patterns and irregularities associated with fraudulent activities or human error.

Figure 1. Conceptual framework of Industry 4.0 in auditing, corporate governance, and firm performance



Furthermore, strong data management plays a critical role in extracting valuable insights from the large volumes of data generated by IoT devices and other digital

systems. As a result, improved transparency and reliable financial information contribute to higher investor confidence and more positive stock market expectations. The emphasis on high-quality financial reporting reflects the increased accuracy and reliability of financial information enabled by these technologies. The overall improvement in financial statements refers to enhanced data integrity, consistency, and confidentiality. Ultimately, these developments contribute to strong financial performance, which represents the primary outcome of successfully integrating AI, IoT, and big data into auditing, controlling, and governance processes.

The practical impact of these relationships is illustrated by the directional links in *Figure 1*, which show how auditing, controlling, and governance functions contribute to improved financial performance. At the same time, enhanced performance reinforces these functions, creating a continuous cycle of improvement.

CONTRIBUTION OF BIG DATA, IOT, AND AI TO CORPORATE EFFICIENCY

In the past, the volume and complexity of big data limited its analytical use; however, recent technological advancements have made large-scale data analysis feasible in real time. Real-time data monitoring enables faster decision-making, reduces inefficiencies, and supports improved business performance and industrial productivity (Özcan & Akkaya, 2020; Böcskei & Hågen, 2017; Hågen & Magyary, 2008). Industry 4.0 technologies also enhance the efficiency and accuracy of business processes. As a result, the role of accountants and auditors is evolving, with less focus on routine tasks and greater emphasis on strategic responsibilities such as resource allocation, long-term planning, and financial control (Ghani & Muhammad, 2019). Similarly, Wahyuni (2020) highlights that big data technologies enable accounting professionals to collect and analyse relevant information, thereby supporting more effective decision-making.

Chen (2021) examined the impact of Industry 4.0 on firms' financial performance using survey-based methods and bootstrap sampling techniques. The findings indicate that Industry 4.0 positively influences internal business processes and supply chain performance, which in turn contribute to improved overall financial performance. The study also shows that both financial performance and customer satisfaction are significantly affected by IoT adoption.

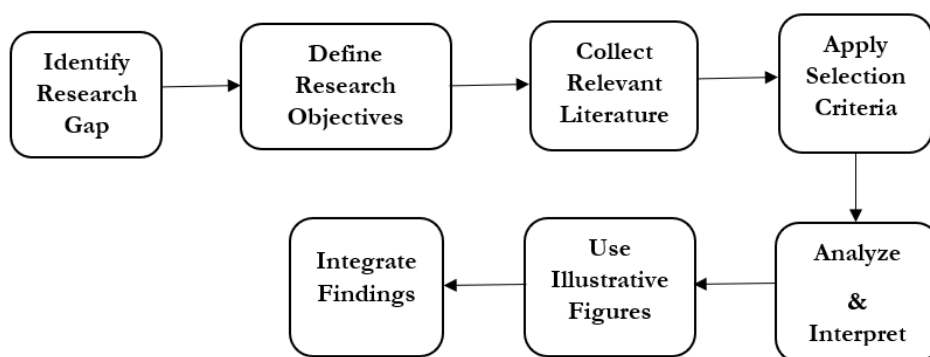
Furthermore, artificial intelligence enables the automation of data processing, allowing financial documents and transactions to be analysed in real time (Odeyemi *et al.*, 2024). This reduces the time required for data collection and analysis, enabling auditors to focus on higher-value analytical tasks rather than repetitive data entry. AI-based anomaly detection algorithms can identify irregularities and potential fraudulent activities as they occur, thereby enhancing risk management and audit effectiveness (Faccia, 2023). In addition, AI can be integrated with technologies such as cloud computing, blockchain, and IoT, enabling real-time auditing in distributed and networked environments (Obenhen *et al.*, 2024). This integration ensures that auditing practices remain efficient and relevant in the context of ongoing technological innovation.

METHODOLOGY

This study adopts a conceptual and integrative literature review approach to examine the impact of AI-driven Industry 4.0 on auditing, corporate governance, and financial performance. Rather than providing original empirical evidence, the research aims to synthesize and critically evaluate existing studies in order to develop a comprehensive theoretical understanding of the topic. The literature was selected based on its relevance to the research objectives, academic credibility, and contribution to the fields of auditing, governance, and digital transformation. Peer-reviewed journal articles, institutional reports, and recent publications were prioritized to ensure the reliability and timeliness of the analysis. In addition, selected figures are used to support and illustrate key concepts discussed in the study. These visual elements are included to enhance conceptual understanding and provide practical insights, rather than to serve as empirical or statistical evidence.

This methodological approach allows for the integration of diverse perspectives and provides a structured framework for analysing the relationships between Industry 4.0 technologies, auditing practices, governance mechanisms, and firm performance. *Figure 2* illustrates the research methodology applied in this study, outlining the main stages of the conceptual and integrative analysis.

Figure 2. Research methodology framework of the study



DISCUSSION AND INTERPRETATION

Effect of Industry 4.0 on audit and corporate governance

Digitalization plays a fundamental role in shaping modern business strategies and strengthening auditing processes and corporate governance mechanisms. It refers to the transformation of business operations through the adoption of digital technologies, enabling the creation of new data streams and value-generating processes (Grove *et al.*, 2018). As a result, organizations are required to rethink their operational models and adapt to increasingly data-driven environments. This transformation significantly affects executives, audit committees, and supervisory

boards, whose responsibilities now include managing digital transformation and developing the necessary digital competencies.

The auditing process has undergone significant transformation as a result of Industry 4.0, which integrates advanced technologies such as blockchain, big data analytics, artificial intelligence, and robotic process automation. These technologies improve audit efficiency, enhance fraud detection, and reduce human error (*Dee et al.*, 2021). AI-driven systems enable real-time analysis of large datasets, thereby improving risk assessment and audit decision-making (*Alles*, 2020). In addition, blockchain technology enhances transparency and security in financial transactions, increasing the reliability of audit processes (*Dai & Vasarhelyi*, 2017).

One of the primary objectives of corporate boards is to enhance organizational value by improving operational efficiency and strategic decision-making. From a governance perspective, Industry 4.0 contributes to more efficient business operations by reducing costs and improving organizational processes. The adoption of digital technologies, including advanced IT systems and flexible automation, can significantly reduce overhead costs and improve operational efficiency (*Grove et al.*, 2018; *Gwala & Mashau*, 2022; *Fazekas & Becsky-Nagy*, 2015; *Fazekas & Becsky-Nagy*, 2019). At the same time, organizations increasingly require leaders with digital competencies who can effectively manage technological change.

Research also suggests that Industry 4.0 has reshaped the role of boards of directors, requiring more active involvement and stronger technological expertise. Directors are expected to possess knowledge in areas such as cyber security, IoT, and big data, as these technologies significantly influence value chains, competitive environments, and corporate strategies. (*Benedek & Takácsné*, 2014; *Grove et al.*, 2018). In response, organizations may establish specialized advisory committees to bridge knowledge gaps and support strategic decision-making. As a result, there is an increasing demand for expertise in areas such as cyber security, the Internet of Things (IoT), and big data. Supervisory boards must therefore develop digital competencies in order to align with the organization's strategic objectives. In addition, specialized advisory committees may help bridge knowledge gaps and support more effective governance (*Grove et al.*, 2018).

Furthermore, blockchain and distributed ledger technologies provide secure and immutable data storage, reducing the need for intermediaries and enhancing trust between stakeholders. These technologies can facilitate more transparent communication between shareholders and boards, thereby improving corporate governance and enabling greater shareholder engagement. As a result, decentralization may significantly influence the functioning of both boards of directors and audit committees (*Christoph*, 2022).

Moreover, Industry 4.0 has significantly transformed the auditing process by leveraging advanced technologies to improve efficiency, profitability, and risk management. *Table 1* presents key differences in auditing and corporate governance systems before and after the adoption of Industry 4.0. Prior to its adoption, auditing processes were characterized by limited fraud detection capabilities, higher rates of financial statement restatements, and longer audit preparation times. With the advancement of digital technologies, audit reports can now be produced more

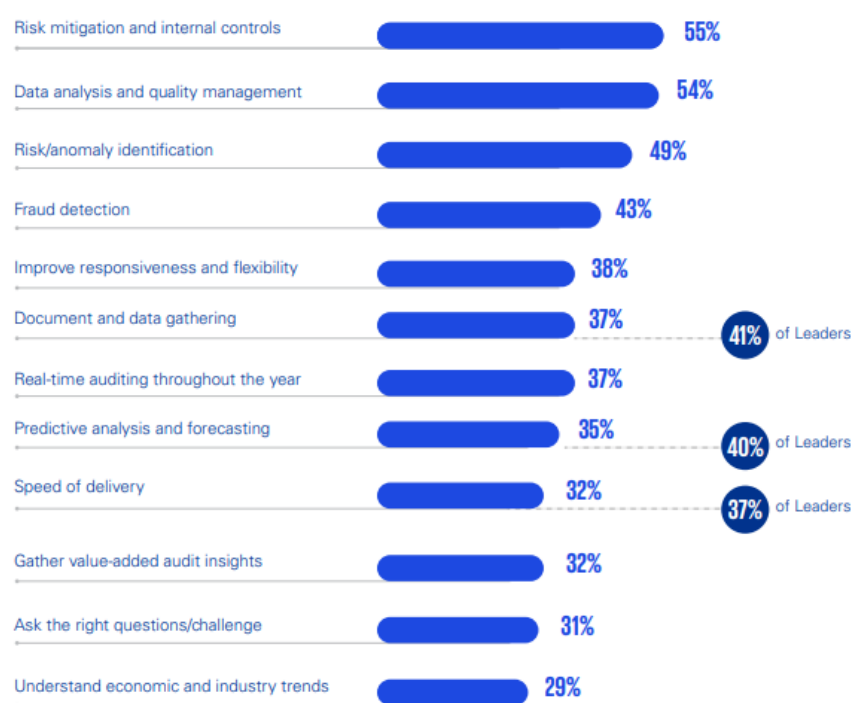
quickly, while AI-driven solutions have significantly enhanced fraud detection and reduced the frequency of financial restatements. In addition, digitalized processes have strengthened internal controls and improved their effectiveness. Furthermore, AI reduces reliance on manual labour and enables real-time monitoring, while also contributing to lower auditing costs and faster detection of irregularities. Increased board activity supports improved corporate governance, and AI-powered risk management enhances decision-making efficiency. Overall, Industry 4.0 has transformed auditing by improving financial oversight, reducing risks, and increasing operational efficiency.

Table 1. Comparison of auditing and corporate governance before and after Industry 4.0

Indicators	Before Industry 4.0	After Industry 4.0	Predicted effect
Reissued financial statements	High	Low	Enhanced efficiency in auditing
Preparation of audit report	Longer duration	Shorter duration	Complete audit reports more quickly
Fraud detection	Low	High	AI enhances the ability to recognize fraud
Control deficiencies	High	Low	Better internal controls are achieved
Audit cost	Expensive	Lower	AI lowers expenses by reducing manual checking.
The effectiveness of internal controls	Low to moderate	Moderate to high	Automatic risk evaluation
Board of Directors meeting	Less frequent	More frequent	Better corporate supervision through the use of digital technologies
Real-time Supervision	Not available	Enabled	An ongoing audit makes it possible to discover fraud on time
Risk Management	Less accurate	More accurate	The decision-making process is enhanced by AI-powered risk management.

Figure 3 further illustrates how AI enhances internal control and financial supervision by prioritizing key audit activities, including risk reduction (55%), data analysis (54%), and fraud detection (43%). These developments support real-time auditing (37%), forecasting (35%), and risk management (49%), thereby reinforcing the impact of Industry 4.0 on audit processes while reducing errors. Moreover, technological advancements improve responsiveness (38%), delivery speed (32%), and insight generation (32%), enabling directors and managers to access timely information for strategic decision-making.

Figure 3. Key audit activities supported by GenAI



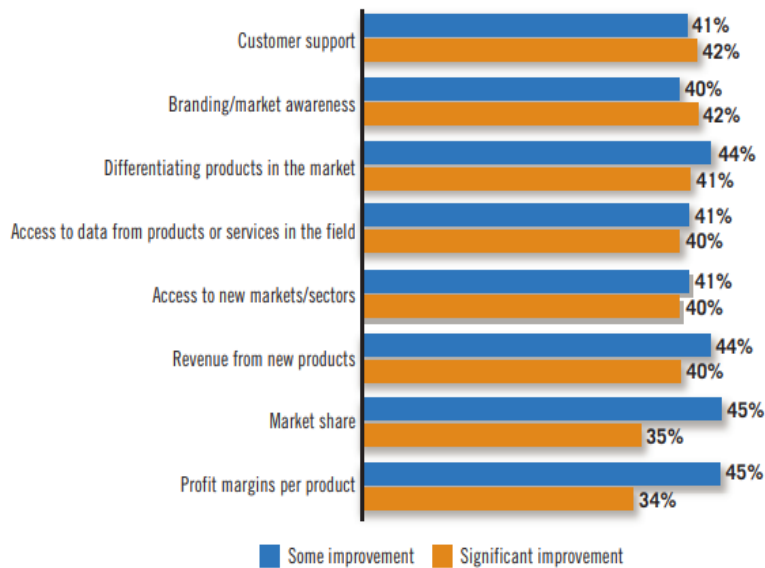
Source: KPMG (2024)

Influence of Industry 4.0 on improving firm performance

Wu et al. (2008) suggest that a firm's technological capabilities enhance operational decision-making, leading to reduced transaction and transportation costs and improved customer satisfaction. The adoption of digital technologies enables companies to strengthen their competitive position through increased productivity, innovation, market awareness, product development, and differentiation (*Yu et al.*, 2021). In addition, technological advancements encourage firms to redesign their organizational structures, optimize operations, and transform value creation processes (*Mubarik et al.*, 2021; *Bag et al.*, 2021).

Figure 4 illustrates the extent of both moderate and significant improvements across various business performance indicators, highlighting the impact of Industry 4.0 on firm performance. The most notable improvements are observed in market share (45%) and profit margins per product (45%), suggesting that digital technologies and machine learning support process optimization and competitive advantage. Significant gains are also evident in revenue from new products (44%) and overall competitiveness (44%), indicating that Industry 4.0 enables firms to develop innovative products and strengthen their market position. Improvements in customer service (42%) and brand recognition (42%) further demonstrate how digitalization enhances customer engagement and organizational visibility.

Figure 4. Impact of industry 4.0 on corporate performance



Source: *MPI-group* (2020)

Furthermore, Industry 4.0 supports data-driven decision-making, leading to enhanced market expansion opportunities, as reflected in improved access to product-related data (41%) and entry into new markets (40%). By integrating AI, IoT, and automation, firms can optimize supply chains, access real-time data, and personalize customer experiences, thereby improving overall performance.

Overall, the findings indicate that Industry 4.0 plays a critical role in enhancing firm performance through increased revenue, market growth, innovation, and customer loyalty. Despite variations in the magnitude of these improvements, the overall impact remains positive. Collectively, these developments provide firms with a sustainable competitive advantage in the digital economy.

CONCLUSION

This study examined the impact of AI-driven Industry 4.0 technologies on auditing practices, corporate governance, and firm performance. The findings demonstrate that the integration of advanced technologies, including artificial intelligence, big data analytics, and the Internet of Things, has significantly transformed traditional auditing processes by improving efficiency, enhancing fraud detection, and enabling real-time monitoring.

In addition, Industry 4.0 has reshaped corporate governance by increasing the need for digitally competent leadership, strengthening transparency, and supporting more effective decision-making processes. The growing reliance on data-driven systems has also contributed to improved internal controls and more responsive governance structures. Furthermore, the results indicate that Industry 4.0 positively

influences firm performance by enhancing operational efficiency, supporting innovation, and enabling organizations to gain a sustainable competitive advantage. The integration of digital technologies allows firms to optimize processes, improve customer engagement, and respond more effectively to dynamic market conditions.

From a practical perspective, the study highlights the importance for organizations to invest in digital capabilities and develop the necessary skills required to manage technological transformation. For policymakers and business leaders, these findings underline the need to support digital adoption while addressing potential risks related to implementation, cyber security, and workforce adaptation.

Although this study provides a comprehensive conceptual overview, it is limited by its reliance on existing literature rather than empirical data. Future research could focus on empirical investigations across different industries and regions to further explore the relationship between Industry 4.0 adoption and organizational performance. Future research may explore empirical evidence on the relationship between Industry 4.0 adoption and corporate financial outcomes across different industries and institutional contexts.

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60 YEARS OF THE RSA – WHAT WILL THE NEXT FIVE YEARS BRING?

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In 2025, the Regional Studies Association (RSA) celebrated the 60th anniversary of its foundation. In addition to its regular professional events, the Association marked the anniversary with a celebratory dinner at its winter conference, held in conjunction with the General Meeting, to which the Association's territorial representatives were also invited. It was here that the RSA Strategic Plan for 2026–2030 was announced. The full community was able to familiarise itself with the strategy in January (<https://www.regionalstudies.org/about/rsa-strategy/>), while the first broad-based meeting on its implementation is taking place on 10 June 2026.

The central message of the Regional Studies Association Strategy 2026–2030 is that decisions and practices affecting regional development should be grounded in robust research evidence. Accordingly, the aim of the RSA is not only to provide scientific support for regional research, but also to facilitate the wider societal, policy-related and practical utilisation of research findings.

The document emphasises that place-based regional thinking is essential for effective public policy-making, particularly in relation to complex challenges such as territorial inequalities, the digital transition, climate change, and questions of social and environmental sustainability. Interdisciplinary research, international cooperation, openness, inclusiveness, and social and environmental responsibility, therefore, occupy a central place in the RSA's value system. The Association understands regional research as a field of knowledge capable of linking scientific reflection with policy and practical action.

One of the most important objectives of the strategy is to support high-quality regional research and increase its visibility. By 2030, the RSA aims to ensure that the value of the regional perspective is more widely recognised by decision-makers, professionals and academic actors operating at local, national and international levels. To this end, it seeks to strengthen the impact of its publications, support open science and access to regional data, and communicate more effectively the importance of regional research to policy, practice and the wider public.

Another key element of the document is the strengthening of research and knowledge networks. According to RSA members, one of the Association's most

important assets is its supportive professional community, based on trust, which creates opportunities for knowledge exchange, cooperation and the development of long-term professional relationships. The strategy, therefore, places strong emphasis on expanding both formal and informal networking opportunities, particularly for students, early career researchers, professionals working in peripheral regions, and regional researchers at risk.

The strategy also seeks to expand and diversify the regional studies community. The RSA aims to become, by 2030, a genuine professional home for those working in regional research and development. This includes increasing membership, tailoring membership services more closely to individual needs, and strengthening inclusive organisational practices. The document highlights in particular the need for the Association to move beyond earlier British or Eurocentric perspectives, and to provide greater space for the representation of the Global South, underrepresented regions, women, young researchers and other less visible groups.

The fourth strategic direction concerns contributing to a more just and sustainable future. The RSA treats sustainability not only as a research topic but also as a principle guiding its organisational operations, including efforts to reduce its environmental impacts, particularly greenhouse gas emissions. In addition, the Association aims to support research and professional activities that contribute to just and green regional transitions. In this context, the strategy also identifies career development, professional recognition, and the education and training of regional researchers, educators and practitioners as important tasks.

As noted above, the RSA has involved its members and territorial representatives in implementing the strategy from the outset. In February 2026, the leader responsible for coordinating the RSA's territorial representatives organised an online meeting for territorial representatives, where the Hungarian section was represented by Viktor Varjú. The aim of the meeting was to ensure that the strategy would be implemented with due consideration of local needs, while also providing further opportunities for members to support their research and channel research results into policy.

In order to strengthen cohesion, the launch of a mentor–mentee programme was proposed, in which renowned professors could undertake mentoring activities with talented young researchers from disadvantaged backgrounds. An expert database could also facilitate the development of new partnerships, including overseas collaborations. Forums established not only for young researchers but also for more experienced scholars at similar career stages and with similar research interests could serve not only professional purposes. Targeted access to databases for researchers within the network could also represent a new opportunity for making use of the benefits of networking and partnership.

RSA membership fees are generally higher than those of other comparable organisations, and its operating model is different. At the same time, the RSA provides its members with numerous internal research and network-development grant opportunities. Taking all this into account, the Association is also working on the development of a more affordable membership scheme, considering the capacities of members from countries in less favourable economic circumstances.

Prepared by: Viktor Varjú, RSA Hungary Section Chair.

Further information about the RSA is available: <https://www.regionalstudies.org/>
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