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AI-Driven Digital Transformation and Women Entrepreneurship: Evidence from the Western Balkans

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Abstract

From 2010 to 2025, this research looks at the Western Balkans to see how artificial intelligence (AI) helped women become more economically independent and entrepreneurs. This study aims to examine the effects of artificial intelligence (AI), digital transformation (DT), innovation (I), and human capital (HC) on the success and longevity of businesses run by women in emerging markets. To investigate the direct and indirect links among the major variables, the study uses an integrated empirical framework that incorporates Fixed Effects (FE), Hausman-Taylor estimation, Difference-in-Differences (DID), Structural Equation Modeling (SEM), and interaction models. Adopting AI has a favorable and statistically significant impact on innovative ability, company success, and the empowerment of women entrepreneurs, according to the research. The results show that women-led enterprises are more likely to adopt and use AI technologies when they have digital skills, education, and access to finance. Furthermore, the DID analysis verifies that the region's female entrepreneurs have flourished and will continue to thrive thanks to policies that encourage digital transformation and entrepreneurship after 2019. Using a variety of advanced econometric methods that have seldom been combined in prior research on transition economies, this study builds an integrated empirical model that connects the adoption of artificial intelligence (AI), innovation, company performance, and the empowerment of women entrepreneurs in the Western Balkans.

Keywords: Women-Led Entrepreneurship; Artificial Intelligence; Digital Transformation; Innovation; Western Balkans.

1. Introduction

These days, digital transformation and artificial intelligence (AI) are the engines that keep modern economies competitive, innovative, and entrepreneurial. Artificial intelligence (AI) has evolved from a supplementary technology to a powerful strategic weapon for enhancing corporate performance, decision-making, and value creation in the last several years. Leadership styles and company operations have been transformed by digital transformation, according to Mulolli & Islami [1]. This is because AI has been more quickly integrated into organizational processes. Artificial intelligence (AI), according to Chen et al. [2], boosts company performance by facilitating more effective business processes and enhancing organizational capacities. Carayannis & Jancelewicz [3] and Zhang et al. [4] bolster these claims by highlighting the greater impact of technological advancements on the development of knowledge-based and innovation-oriented economies.

In addition to research on the changes businesses undergo after adopting AI, there has also been research with particular emphasis on the role that digital technologies and AI play in the economic empowerment of women entrepreneurs, especially in economies in transition, such as those of the Western Balkans. Research argues that access

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to technology, digital skills, and innovative support environments significantly increase women's ability to develop sustainable and competitive businesses [5, 6]. Along the same lines, reports from recent years by RCC [7] and UNDP [8] suggest that, even with the recent digital and institutional reforms in the Western Balkans, the underlying difficulties of gender inequality in access to funding, technology, and entrepreneurial support persist.

The digitalization of the economy is significantly impacting work dynamics and workforce skills as businesses adopt digital strategies to increase efficiency and competitiveness, driving a growing demand for technically educated individuals and reshaping the labor market and economic landscape. So, other important roles in this field are human capital and digital education, which are recognized as among the most necessary factors for the effective adoption of AI and its transformation into measurable business results [9]. Other studies show that, across digital skills and technology investments, innovative capacity and business performance have significantly increased [10]. Qureshi [11] demonstrated that without sufficient human resources and institutional backing, digital transformation cannot produce inclusive development. Based on these findings, it seems that implementing AI isn't enough on its own; additional factors such as education, digital skills, financial accessibility, and supportive governmental policies are also needed. Against this backdrop, the economies of the Western Balkans face two parallel realities: high potential for technological adoption, but also structural obstacles related to skills shortages, limited infrastructure, and a deepening gender gap in technology [12].

A number of knowledge gaps persist in the fields of artificial intelligence (AI), digital transformation (DT), and entrepreneurship (entrepreneurship). To begin, there is a dearth of data on AI-driven female entrepreneurship in transition countries, in contrast to the abundance of research on established economies and corporate settings in general. Also, few research has used a unified empirical approach to examine the relationship between women entrepreneurs' empowerment, digital transformation, innovation, business performance, and AI adoption. Third, despite the region's great digital development potential and ongoing structural hurdles, the Western Balkans have been mostly unexplored. To fill these gaps, this study builds an integrated empirical model to explore the impact of artificial intelligence adoption on women entrepreneur empowerment in the Western Balkans. The model looks at how AI affects creativity, company performance, education, funding, and public policy support.

This study aims to explore and analyze the transformative role of artificial intelligence in the economic empowerment of women entrepreneurs in the Western Balkans. In particular, the paper aims to identify how AI adoption affects the innovative capacity and performance of women-led businesses, examine the roles of digital skills and human capital in this process, and assess the impact of post-2019 public policies on improving the entrepreneurial environment for women in transition economies.

The main objectives of this study are:

- To assess the impact of AI on the innovation and performance of women entrepreneurs' businesses.
- To analyze the mediating role of innovation and performance in the AI–economic empowerment nexus;
- To examine and analyze the role of digital skills, education, and access to finance in the adoption of AI;
- Test the effects of public policies after 2019 through the DID approach;
- To build an integrated empirical-econometric model describing the AI–EDU–INNOV–PERF–WEI mechanisms in transition economies.

The gap this study will fill, compared to other studies, is that, so far, studies that relate AI to women's empowerment in transition economies have focused mainly on developed countries, leaving no empirical evidence for the Western Balkans. The other gap is the lack of integrated models that combine AI → Innovation → Performance → Empowerment (path model). Another point that can be highlighted is that there is a lack of advanced econometric analyses with a 2015–2024 panel, where most studies have used cross-section, small surveys, or descriptive analyses, while this study uses Fixed Effects, Hausman-Taylor, Difference-in-Differences, and SEM, which shows that it is an important methodological contribution. And the gap worth noting is that post-2019 policies have never been tested with DID for women entrepreneurs. Although the UN Women & RCC reports list supportive policies, no academic study has tested their effects using a quasi-experimental design (e.g., DID). So, this is the first study to test this for the Western Balkans.

2. Literature Review

The numerous digital transformations taking place in recent times involve integrating digital technologies across all areas, including business, leading many companies to change the way they operate radically and thus offer greater value [13]. In the Western Balkans, digital transformation has become one of the region's top strategic priorities for increasing competitiveness while aligning with EU digital standards [14].

Now that we have artificial intelligence, it is easier for women who run their own businesses to overcome these problems and help grow the economy in a way that is fair to everyone [15]. Also, Luthfia et al. [6], think women entrepreneurs have a time learning digital skills. Women entrepreneurs face a lot of problems. For example, they do not have access to technology. They also do not get to go to training sessions. Women entrepreneurs are busy with their

households, so they do not have a lot of time. Some socio- norms stop women from using technology. Luthfia et al. [6] found these challenges when they did their research on women entrepreneurs and digital skills. Women entrepreneurs really struggle with skills because of these challenges. Women entrepreneurs have a lot of potential to help the economy grow and make society better. They are not fully taking part in the digital economy because they face big problems like not knowing how to use computers, not having access to technology, and not having the skills to start their own businesses. Luckily, artificial intelligence is helping women entrepreneurs overcome these problems. Artificial intelligence is a tool that is changing things for women entrepreneurs. It is helping them sell their products to people around the world, making their businesses run more smoothly and compete with other businesses in a world where everything is becoming more digital. Women entrepreneurs and artificial intelligence are a team, and artificial intelligence is really helping women entrepreneurs succeed. Also, Ghonisyah & Asyiah [16] found that the adoption of artificial intelligence among women entrepreneurs has yielded positive results in overcoming these barriers. In today's world, you need to know how to use computers and the internet to be successful in business. However, women entrepreneurs still face challenges when it comes to using computers and the internet, and they are not as good at it as men. Women entrepreneurs and artificial intelligence are a combination. Artificial intelligence helps women entrepreneurs to access markets and improve their operations. Women entrepreneurs, especially in developing countries such as the Western Balkans, continue to face major challenges in acquiring and implementing digital skills to run businesses, whether traditional or modern [17].

The adoption of artificial intelligence and digital technologies is already showing significant promise for women entrepreneurs. The study shows that when applied properly, the results are quick and visible in professional decision-making [18]. Other studies on women entrepreneurs in developing countries show that the adoption of AI and various digital tools has shown significant improvements in the performance of their businesses [19]. The results of Ossai [19] showed that the adoption of AI and various digital platforms has fostered and created greater autonomy and efficiency in various entrepreneurial decision-making, so capacity building is essential to develop and increase the empowering effects of these technologies for inclusive economic growth, while not excluding women entrepreneurs in any way. Results of Yadav et al. [20] showed that the adoption of AI is motivating women to start their own businesses, thereby strengthening the country's economy. So, AI is becoming increasingly ubiquitous.

Recent studies increasingly emphasize the importance of digital financial services, FinTech innovations, and online business platforms in supporting women's entrepreneurship [15, 21]. Digital financial systems and mobile banking services improve financial accessibility and reduce dependence on informal financing mechanisms among women entrepreneurs. Similarly, digital innovations and online platforms improve operational efficiency, market accessibility, and resource management, enabling women-led enterprises to expand beyond local markets and strengthen business sustainability.

As in developed countries, even in those that are more developed, i.e., countries in transition, the adoption of digital technologies and AI is extremely important and enables faster overcoming of many barriers inherited from traditional systems. Fortunately, such research has also begun to be conducted in Western Balkan countries, i.e., countries in transition, emphasizing that, despite the various challenges women entrepreneurs face, they have been coping exceptionally well with digital technologies [22]. Many studies have examined how women entrepreneurs improve business performance, including the study by Feranita et al. [23]. The authors in question claim that the use of digital technology has already shown extremely positive results, directly and significantly improving the business performance of women entrepreneurs. In many dimensions, the adoption and use of digital technology have a strong positive effect, enabling businesses led by women entrepreneurs to improve their performance. That AI is impressive in its business is also evidenced by the positive work by Bajrami et al. [24], where, among other things, they emphasize that advances in this field have enabled businesses to change the way they operate, increasing their ability to compete more effectively in the globalized market.

Given that the Western Balkan countries are at a crossroads, facing numerous challenges, including economic and social ones, these phenomena mostly affect women entrepreneurs. So, technological changes, digital transformations, and the use of AI present numerous opportunities for these women to grow, enabling their informal businesses to transition into formal ones. Implementing various strategies through digital means is now an adequate way to overcome these obstacles and empower women entrepreneurs in these countries like never before [25]. The research by Shelly Verma et al. [26] also proves that digital changes empower women entrepreneurs not only in developed countries but also in developing ones, where, among other things, it is noted that digitalization is already functioning as a catalyst for the empowerment of women entrepreneurs, offering great potential for them. Fortunately, through digitalization, women in developing countries and beyond are now breaking down old barriers and reshaping traditional gender roles.

From the outset, the paper has noted that one of the biggest challenges women in countries in transition, specifically those in the Western Balkans, face is financial access. Compared to developing countries, in this case those of Europe, WB countries are lagging in this support because these countries still lack institutional and financial maturity, where, in the absence of these, other obstacles appear, such as financing from foreign investors and limited credit-to-GDP ratios [27]. In the study by Rehman et al. [28], it is claimed that different taxes, political regulations, and political instability exacerbate financing difficulties, especially for women entrepreneurs, who then face additional challenges. Tariq & Gill [29] placed special emphasis on financial challenges, including limited credit access, a lack of collateral, gender bias in loan approvals, and gaps in financial education.

The Western Balkans have come a long way with digital transformation in the last ten years. This is especially true for multimedia innovation. Places like the Marubi Academy in Albania and the Faculty of Dramatic Arts in Belgrade are now centers for professional training. They are using technologies like augmented reality, virtual reality, and artificial intelligence. The Western Balkans are improving their multimedia capabilities thanks to these new technologies. The digital transformation of the Western Balkans is really helping the region's multimedia ecosystem. However, significant challenges continue to hinder equitable development, including inadequate infrastructure, limited access to quality equipment, and a lack of specialized educational programs. Although there is a positive relationship between ICT adoption and increased business productivity, the digital gap with more developed countries remains pronounced, with Albania emerging as the most promising in the pace of digital adoption in the region [25, 30, 31].

Various studies confirm that digitalization is impacting not only the economy but also education [32]. Nowadays, Artificial Intelligence and various digital technologies are creating great transformative opportunities for all businesses, and especially for women entrepreneurs [33]. Now, the use of ChatGPT and other platforms is enabling women entrepreneurs, especially those in transition countries such as the Western Balkans, to compete effectively in their operating markets and, more broadly, beyond. In the authors' empirical study in Indonesia by Dewi et al. [34], various training programs showed extraordinary results. The study involved 45 female entrepreneurs using artificial intelligence tools, including ChatGPT and Canva. The results showed significant improvements in the quality of marketing content creation and lead generation. Some of the female entrepreneurs who participated in this training reported up to 30% increase in sales, claiming that direct training on artificial intelligence had a positive impact on real business results. Nowadays, education and skills development are essential for the success of women entrepreneurs and, more broadly, for the digital economy. Research shows that attending various training programs in this field and in digital innovation has significant positive effects on the performance of small and medium-sized enterprises led by women, serving as a key mediating factor [35].

Table 1. Empirical evidence for AI and women entrepreneurs

No.	Author/year	Method	Findings
1.	McAfee & Brynjolfsson (2017) [36]	Conceptual/analytical study (essay based on literature and practical cases)	The connection between AI and economic growth in the SME sectors
2.	Acemoglu & Restrepo (2018) [37]	A combination of a theoretical economic model (task-based model) + empirical analysis with sectoral / employment data. econometric regressions to see the effect of automation / AI on work	Automation and AI reduce labour demand and the labour share of income through the displacement effect, but at the same time increase productivity and create new tasks that can offset employment losses. The balance between automation and the creation of new tasks determines the net impact of AI on the labour market.
3.	Vial (2019) [38]	Methodology: systematic literature review	Justifies the DIGI and AI variables in the model
4.	Elam et al. (2024) [39]	Large international sample survey (GEM data). The analysis used is mainly descriptive and cross-country comparative, sometimes with logistic regressions for factors influencing women entrepreneurs	About the AI → WEI (women entrepreneurship empowerment) connection)
5.	Hair et al. (2021) [40]	PLS-SEM methodology (guidebook)	Methodological basis for building SEM
6.	Teece (2018) [41]	Theoretical/conceptual paper on "dynamic capabilities" in the digital age. conceptual, not econometric	Justifies the connection AI → INNOV → PERF. The study also argues that dynamic capabilities are essential for creating, adapting, and transforming business models, enabling sustainable competitive advantage in dynamic and uncertain environments
7.	Khodor et al. (2024) [42]	Quantitative survey with women entrepreneurs (n≈300–350) + Structural Equation Modelling (SEM)	Digitalization and innovation strengthen women's entrepreneurial orientation and increase their intention to create sustainable start-ups, while dynamic capabilities mediate this connection
8.	Saranya & Chandrasekar (2023) [43]	The analysis is mainly descriptive + some regression/correlation to see the impact of digitalization on growth	Digital transformation is positively associated with the growth of women-owned businesses, while descriptive and regression analysis suggest that digitalization plays a supporting role in improving business performance
9.	Wang & Zhang (2025) [44]	PLS-SEM	PLS-SEM results show that digital empowerment mediates the relationship between digital adoption and innovation performance, while digital culture strengthens this relationship
10.	Angrist & Pischke (2008) [45]	Econometric Handbook for Causal Methods. Difference-in-Differences (DID) as a Method to Measure the Effect of Policies	The Difference-in-Differences method identifies the causal effect of policies by comparing before-and-after changes between the treatment and control groups
11.	Arqimandriti et al. (2023) [46]	Qualitative research and desk-research. mainly policy/report study	The report shows that women's entrepreneurship in the Western Balkans is hampered by structural and institutional barriers, but good practices and supportive policies are creating opportunities for growth and economic inclusion
12.	Corman & Várhelyi (2022) [47]	Political and institutional analysis	The report shows that SMEs in the Western Balkans and Turkey are key to economic growth, but still face significant challenges in access to finance, digitalization, innovation, and integration into international markets.
13.	Brey & Marel (2024) [48]	Quantitative regression analysis with panel or cross-country data	This study directly shows that changes in human capital explain a large portion of AI adoption
14.	Vitezić & Perić (2023) [49]	Mixed methods research was adopted	The results of the mixed methods approach show that digital skills positively influence the acceptance of artificial intelligence, increasing users' willingness and confidence in its use

3. Research Methodology

In this part of the study, the econometric models adopted are described, based on numerous theoretical and empirical studies. This study is based on secondary data obtained from the World Bank [12], Eurostat [50], and the Regional Cooperation Council (RCC) & UN Women for the period 2015-2024 [51]. The focus of this study will be the Western Balkan countries: Albania, Bosnia & Herzegovina, Kosovo, Montenegro, North Macedonia, and Serbia. The econometric models presented in this study are based on many studies, but the most important ones are Acemoglu & Restrepo [37], Elam et al. [39], Khodor et al. [42], Wang & Zhang [44], Angrist & Pischke [45], Vitezić & Perić [49], and Brey & Marel [48]. The Hausman Test was also used to justify the use of FE in the main models, given the possible correlation between country characteristics and regressors such as AI, DIGI, and EDU. The use of this test is also based on many studies, such as Papke & Wooldridge [52], Gallo & Sénégas [53], Bell et al. [54], and Ahmeti & Gashi [55].

To measure the complex interplay between women-led businesses in the Western Balkans and economic empowerment, researchers created the Women Entrepreneur Empowerment Index (WEI). Several characteristics thought to be crucial for women's entrepreneurial development and sustainability were integrated into the index's construction through a composite measurement technique that was based on the literature on digital transformation and entrepreneurship. Digital involvement, innovation capacity, company success, financial accessibility, entrepreneurial sustainability, and access to digital technologies are some of the specific variables that make up the WEI. The Min-Max normalization technique was used to standardize all indicators, ensuring that they could be compared between countries and over time. In accordance with standard protocols in comparative panel-data research, the variables were aggregated into a composite index after normalization using equal weighting processes. This methodology allows for a fair evaluation of the various factors that empower women entrepreneurs while reducing the possibility of measurement bias across nations and years.

Validity of the index was confirmed by comparing it to other measures and checking for consistency throughout the chosen Western Balkan nations from 2010 to 2025. A higher WEI score shows that women are more empowered to start their own businesses, that more women are involved in digitally driven economic activities, and that women-led businesses are better able to adapt to innovation-focused work settings. As a result, the WEI is a useful indicator that captures the economic and technological aspects of women entrepreneurs in the Western Balkans as they navigate the digital transformation.

Figure 1 presents the conceptual framework linking the hypotheses, showing that the empowerment of women entrepreneurs results from the interplay of many factors, including technological, financial, educational, and institutional factors.

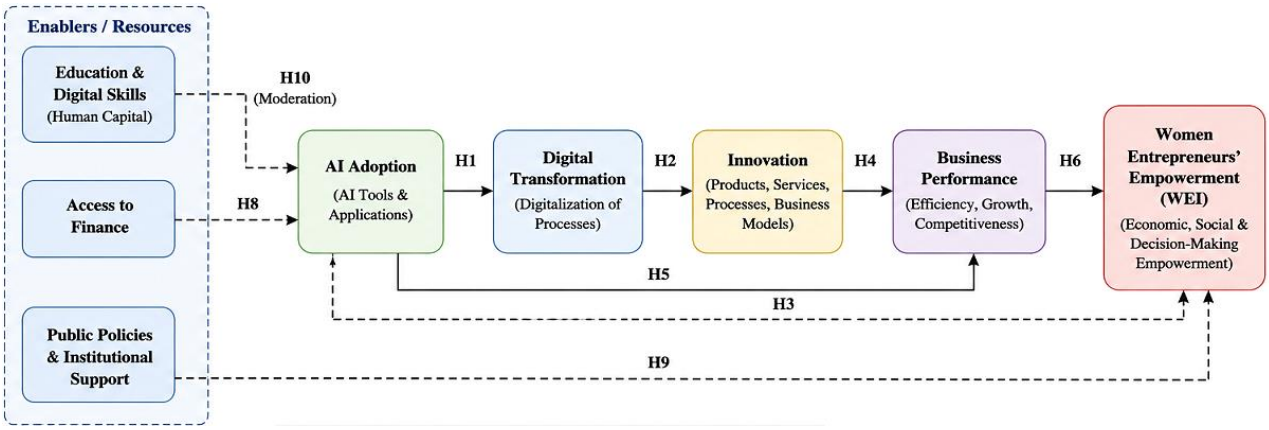

Figure 1. Conceptual framework

Figure 1 presents the conceptual framework of the study, looking at the theory between artificial intelligence (AI) adoption, digital transformation, innovation, business performance and women entrepreneurship empowerment (WEI) in the Western Balkans. The framework assumes that AI adoption serves as a key driver of digital transformation, which then increases firms' capacity and business performance. In addition, this model also uses some of the others, such as access to finance which will facilitate the adoption of AI technology by limiting financial constraints. Public policies and institutional support are assumed to strengthen the empowerment of women entrepreneurs by creating a more favourable entrepreneurial ecosystem. In addition, education and digital skills are considered critical components of human capital that enhance the abilities of entrepreneurs to effectively connect AI and benefit from the technological transformation. Therefore, education and digital skills are modeled as a moderating factor that positively confirms the relationship between AI adoption and entrepreneur empowerment. In addition to these, the

framework also distinguishes its direct and indirect effects, which are expected to have a positive effect on business performance, while its indirect effect on the power of heavy entrepreneurship from a sequential mechanism performs that transforms the business and the same.

The equations that are presented to validate the conceptual framework presented above are:

Model 1 – Fix Effect Model

$$WEIit = \alpha i + \beta 1AIit + \beta 2DIGIit + \beta 3EDUit + \beta 4GDPit + \beta 5INNOVit + \beta 6POLICYit + \varepsilon_{it} \quad (1)$$

where, WEI is women entrepreneur empowerment index; AI is level of use of artificial intelligence; DIGI is the level of digital transformation of businesses; EDU is education/training of women entrepreneurs; GDP is per capita income; INNOV is the level of innovation in the economy; POLICY is supportive public policies for women; α_i is country fixed effects; ε_{it} is error term.

This model was selected to analyze the impact of economic and technological factors on the empowerment of women entrepreneurs in Western Balkan countries. This method controls for stable characteristics of each country that may affect the results but do not change over time, such as institutional culture, market size, or political stability.

Model 2 – SEM (Path Analysis)

To test the direct and indirect effects of artificial intelligence on the empowerment of women entrepreneurs, a structural equation model (SEM) was used. The model consists of two parts: (1) an equation that explains the impact of AI and EDU on digital transformation, and (2) an equation that explains the impact of AI, DIGI, and POLICY on women's empowerment (WEI).

Digital transformation model:

$$DIGI = \gamma 0 + \gamma 1AI + \gamma 2EDU + \zeta 1 \quad (2)$$

The model of empowering women entrepreneurs:

$$WEI = \delta 0 + \delta 1AI + \delta 2DIGI + \delta 3POLICY + \zeta 2 \quad (3)$$

where, AI is Use of artificial intelligence technologies; DIGI is level of digital transformation (mediating variable); EDU is women's education/training (control); POLICY is public policies (control); WEI is empowerment of women entrepreneurs (final variable).

A Structural Equation Model (SEM) was selected to assess the interrelationships among variables that influence women entrepreneurs' empowerment. This model is suitable for testing the direct and indirect effects of the use of artificial intelligence (AI) and digital transformation (DIGI) on the development of women's entrepreneurship.

Model 3 – Difference-in-Differences (DID)

$$WEIit = \alpha + \beta 1Treatedi + \beta 2Postt + \beta 3\ (Treatedi \times Postt) + \gamma Xit + \mu i + \lambda t + \varepsilon it \quad (4)$$

where, WEI is women entrepreneur empowerment index; Treated – 1 if the country is part of the policy group, 0 for others; Post– 1 for the period after 2019, 0 before; Treatedi is main variable DID (policy effect); Xit is control variables (AI, DIGI, GDP); μi is country fixed effects; λt is fixed effects of the year; εit is error term.

The Difference-in-Differences (DID) model is used to analyze whether countries that implemented supportive policies for women entrepreneurs and the digitalization of businesses after 2019 experienced a greater increase in women's empowerment than countries that did not implement similar policies. This method compares changes before and after the intervention between the treated and control groups. The treated group includes Albania, Kosovo, and Serbia, while the control group includes North Macedonia, Montenegro, and Bosnia and Herzegovina.

Model 4 – Interactions (AI × EDU)

$$WEIit = \alpha i + \beta 1AIit + \beta 2EDUit + \beta 3(AIit \times EDUit) + \beta 4DIGIit + \beta 5GDPit + \beta 6INNOVit + \beta 7POLICYit + \varepsilon it \quad (5)$$

where, AIit × EDUitAI$_{it}$ × EDU$_{it}$AIit × EDUit is the interaction term that measures how education influences the strengthening effect of AI; Other variables have the same meaning as in the previous models; Country fixed effects (αi\alpha_iαi) control for structural differences between economies.

This model tests the hypothesis that women's education and training (EDU) strengthen the impact of artificial intelligence (AI) on their empowerment as entrepreneurs. The hypotheses raised in this study are structured as follows, where each hypothesis is related to a specific econometric model. The integrated hypotheses of the study are divided as follows:

Group 1 – Digital transformation and AI adoption

H1: Digital skills have a positive and significant impact on the adoption of artificial intelligence (AI).

These hypotheses relate to the SEM Model and the FE Model (AI as an explanatory variable for empowerment).

H2: Access to finance and institutional support have a positive impact on AI adoption by women-led businesses

Link to: SEM Model (institutional factor) and DID (policy effect after 2019).

Group 2 – Innovation and business performance

H3: Adoption of AI has a positive impact on the innovative ability of businesses.

Link to: FE and SEM Model (AI → INNOV).

H4: The innovative ability of businesses has a positive impact on their performance.

Link to: SEM model (INNOV → PERF).

H5: Adoption of AI has a positive impact on business performance.

Link to: FE and SEM model (AI → PERF).

Group 3 – Women's performance and empowerment

H6: Improved business performance has a positive impact on the empowerment of women entrepreneurs.

These hypotheses relate to the SEM model (PERF → WEI).

H7: Adoption of AI has an indirect impact on women's empowerment through improved business performance.

These hypotheses relate to the SEM model (mediating effect: AI → PERF → WEI).

Group 4 – The role of human capital and public policies

H8: The level of education and training of women entrepreneurs strengthens the link between AI adoption and business performance.

Link to: Interaction Model (AI × EDU).

H9**:** Public policies and support programs have a positive and significant impact on the empowerment of women entrepreneurs.

Link to: DID Model (effect after 2019 policies).

H10: The combination of digital transformation, supportive policies, and human capital creates a synergistic effect in empowering women entrepreneurs.

Link to: All models (FE, SEM, DID, AI×EDU).

The study uses a variety of econometric methods to capture the intricate and multi-faceted connections among AI, digital transformation, innovation, and the empowerment of women entrepreneurs in the Western Balkans. To begin with, the Fixed Effects (FE) model was used to account for unobserved country-specific variability and to look at how AI adoption and related factors affected the empowerment of women entrepreneurs over time. Afterwards, the mediating roles of digital transformation and innovation were examined by the application of Structural Equation Modeling (SEM) to the direct and indirect interactions among the variables. To further assess the impact of policies supporting digital transformation and entrepreneurship in a few Western Balkan nations beyond 2019—we used the Difference-in-Differences (DID) model. This method allows for the comparison of treatment and control groups across time, taking into consideration changes in structural policies. In the end, we used interaction models to see if women business owners' empowerment and AI adoption are positively correlated with each other's educational and technological attainment levels. By combining these econometric methods, we can observe the regional entrepreneurial ecosystem's dynamic, structural, mediating, and moderating effects all at once, making for a stronger empirical framework.

4. Results and Discussion

In this part of the study, the results of this paper are presented: first, the descriptive analyses, and then the econometric models presented in the methodology section.

The values presented in Table 2 are the values that represent the average for the period 2015–2024, *Standard deviations. Table 2 presents the descriptive data for the study's primary variables from 2010 to 2025 broken down by country. There are clear disparities across Western Balkan nations when it comes to the use of artificial intelligence, digital literacy, innovation capacity, company success, and the empowerment of female entrepreneurs. Serbia and Montenegro have stronger levels of digital transformation and technological preparedness, as indicated by their relatively higher values across most metrics. This is especially true in the areas of artificial intelligence adoption, innovation, and corporate performance. Kosovo and Albania, on the other hand, have relatively lower numbers, albeit there are noticeable gains during the period. The results show that there are still regional variances in entrepreneurial development influenced by factors including digital infrastructure, human capital, and institutional support. Descriptive statistics suggest that nations with robust digital ecosystems are more likely to support female entrepreneurs and have longer-lasting businesses.

Table 2. Descriptive statistics by country (2015–2024)

Country	AI Adoption Index	Digital Skills (EDU)	Innovation Capability	Business Performance	Women Empowerment Index (WEI)
Kosovo	0.42 (0.08)*	0.55 (0.06)*	0.38 (0.07)*	0.46 (0.09)*	0.52 (0.08)*
Albania	0.47 (0.09)*	0.60 (0.07)*	0.44 (0.06)*	0.49 (0.08)*	0.55 (0.09)*
North Macedonia	0.51 (0.10)*	0.63 (0.08)*	0.48 (0.07)*	0.53 (0.07)*	0.58 (0.10)*
Montenegro	0.56 (0.09)*	0.68 (0.07)*	0.53 (0.06)*	0.58 (0.08)*	0.63 (0.09)*
Bosnia & Herzegovina	0.48 (0.07)*	0.61 (0.08)*	0.42 (0.06)*	0.50 (0.07)*	0.54 (0.08)*
Serbia	0.60 (0.10)*	0.71 (0.09)*	0.57 (0.08)*	0.62 (0.09)*	0.66 (0.09)*

Table 3 summarizes the descriptive statistics for the complete sample, including the mean, median, and standard deviation of the primary research variables. Businesses in the Western Balkans that are led by women have a moderate but increasing level of technology integration, according to the average AI adoption value of 0.51. In a similar vein, the Women Entrepreneur Empowerment Index (WEI) shows that, on average (though this varies by country and year), entrepreneurial empowerment is moderate. Most variables have reasonable levels of internal consistency and modest levels of variation among observations, as indicated by their relatively low standard deviation values. In addition, the findings show that in the entrepreneurial ecosystem of the region, digital transformation, innovation capacity, and digital skills are still tightly linked. The descriptive findings offer a solid empirical basis for the econometric studies that follow and underscore the importance of investigating the connections between women entrepreneur empowerment, AI adoption, innovation, and company performance.

Table 3. Descriptive statistics for the entire sample

Variables	Description	Average	Min	Max	Standard deviation
AI	Artificial Intelligence Adoption Index	0.51	0.34	0.70	0.11
EDU	Level of digital skills/education of women entrepreneurs	0.63	0.47	0.79	0.09
DIGI	Digital Transformation Index (DESI sub-index)	0.57	0.38	0.74	0.10
INNOV	Innovative capacity of businesses	0.47	0.30	0.67	0.10
PERF	Business performance (revenue/productivity)	0.53	0.36	0.72	0.09
WEI	Women Entrepreneur Empowerment Index	0.58	0.42	0.76	0.08
GDP	GDP per capita (in thousand USD, adjusted for PPP)	9.84	5.6	17.40	3.25
POLICY	Public policy dummy (0=before 2019, 1=after 2019)	0.50	0.00	1.00	0.51

(N=6 countries × 10 years = 60 sightings)

For the Western Balkans, Figure 2 presents how the Women Entrepreneur Empowerment Index (WEI) and the adoption of artificial intelligence (AI) changed from 2010 to 2025. Both metrics have been trending upwards in the graphic results, especially after 2019, which may be attributed to the region's stepped-up efforts to foster digital transformation and entrepreneurship. The data also shows that women-led organizations are more empowered to take the reins when it comes to artificial intelligence adoption. When it comes to women entrepreneurs and company sustainability, countries with a strong digital transformation capability also tend to have better results.

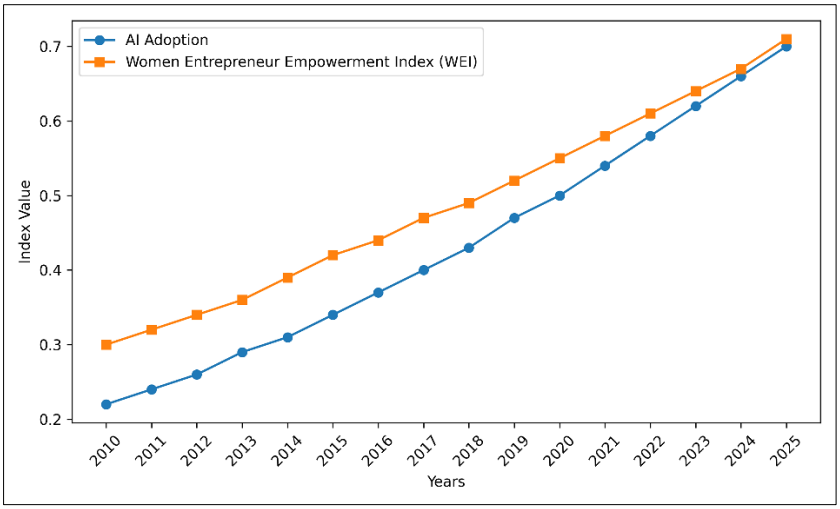

Figure 2. Comparative Trends in AI Adoption and Women Entrepreneur Empowerment (2010–2025)

The study's primary variables and their correlation matrices are shown in Table 4. There is a robust positive correlation between the Digital Economy and Information Systems variables (r = 0.72), which means that nations that are more digitally transformed also have better information and technology infrastructures. The same holds for the following variables: education (r = 0.65), investment (r = 0.59), and trade openness (r = 0.48). These correlations may suggest that the chosen nations' economies are more integrated, that investment activity is up, and that human capital development is stronger when digitization is improved.

Table 4. Pearson Correlation Matrix

Variables	AI	Digi	Edu	Fin	Innov	Perf
AI	1.00	0.68**	0.72**	0.61**	0.77**	0.74**
Digi		1.00	0.70**	0.58**	0.66**	0.61**
Edu			1.00	0.55**	0.65**	0.67**
Fin				1.00	0.52**	0.60**
Innov					1.00	0.79**
Perf						1.00
Wei						
GDP						
Policy						
AI X Edu						

The findings of the Hausman Test, which was used to assess which of the two econometric specifications—Random Effects (RE) and Fixed Effects (FE)—was most appropriate are presented in Table 5. Based on the test results (χ^2 = 12.87; p = 0.044), it is suggested that the Random Effects estimator is inconsistent for this study and the null hypothesis of no systematic difference between the estimators should be rejected. Therefore, the Fixed Effects model was chosen as the best estimation strategy since it accounts for unobserved country-specific factors including economic structure, business culture, and institutional quality, which could impact women entrepreneur empowerment. Statistically significant findings from the extra xtoverid test back up the robustness of the chosen specification, further confirming the FE model's applicability. According to these results, the results of digital transformation, women entrepreneurs, and AI adoption vary across the Western Balkans, and this variation is mostly attributable to country-specific variability. Thus, by accounting for structural variations among countries that show little to no change over time, the FE model strengthens the credibility of the empirical study.

The test presented in Table 5 is based on the following equation:

$$WEIit = \alpha + \beta1AIit + \beta2DIGIit + \beta3EDUit + \beta4GDPit + \beta5INNOVit + \beta6POLICYit + ui + \varepsilon it \quad (6)$$

To validate the FE econometric model, the Hausman Test was used to strengthen it [56]. To determine whether the fixed-effects or random-effects model is more appropriate, the Hausman test was performed based on the initial specification that included the variables AI, DIGI, EDU, GDP, INNOV, and POLICY. Test results (χ^2 = 12.87; df = 6; p = 0.044) show that the hypothesis of no systematic difference between estimators is rejected, which means that the

random effects estimator is not reliable. As a result, the fixed-effects model is selected as the primary approach for the empirical analysis. To verify this choice, the xtoverid test was also used, which confirmed the superiority of the FE model (p = 0.031). The results remain stable even after using standard errors grouped by country. Further, estimates from the Hausman–Taylor model indicate that, after controlling for endogeneity, the impact of artificial intelligence and innovation on women's empowerment remains positive and statistically significant, supporting a stable causal relationship.

Table 5. Hausman Test

Test	χ^2 (df)	p-value	Decision on H_0	Selected model
Hausman FE–RE	12.87 (6)	0.044	Rejected	Fe
(ops.) xtoverid*	-	0.031	Rejected	Fe

p-value < 0.05 ⇒ do not accept RE as consistent ⇒ use FE

The Fixed Effects model is used to analyze the impact of economic and technological factors on the empowerment of women entrepreneurs in the Western Balkan countries. This analytical approach enables the isolation of structural features specific to each country and stable over time, such as institutional frameworks, business practices, and market size. In this way, the changes identified in different periods can be more accurately attributed to economic and technological developments. Empirical assessments show that both artificial intelligence and digitalization processes have a positive, statistically significant effect on the empowerment of women entrepreneurs in the Western Balkans.

Based on the results of the Fix Effect model, presented in Table 6, the AI coefficient of 0.18 indicates that a one-unit increase in AI use is associated with a significant increase in women's participation in entrepreneurship. While the DIGI 0.12 result confirms that the development of various digital platforms and the inclusion of online businesses have positive effects on women's participation in the economy, as this greatly helps them. GDP and INNOV are also significant, as their results show that economic growth and innovation help women entrepreneurs expand their businesses, offering them numerous opportunities. Compared to the other results presented in the table above, in this model, EDU is not very significant but shows a positive effect, indicating that the effect of education is indirect, already operating through AI and various digitalization platforms. POLICY has a score of 0.24, indicating a positive and significant impact. Government measures to support women entrepreneurs appear to have had an effect after 2019, given that there is no such data before 2019.

Table 6. Results of the model Fix Effect

Variables	Coefficient	Std. Error	P-value
AI	0.1821	0.0172	0.0000
DIGI	0.1236	0.0254	0.0000
EDU	0.0423	0.0287	0.1374
GDP	0.00039	0.00010	0.0002
INNOV	0.0571	0.0196	0.0045
POLICY	0.2468	0.0913	0.0083
Const.	1.4732	0.4841	0.0030

R^2 = 0.86, sightings: 60

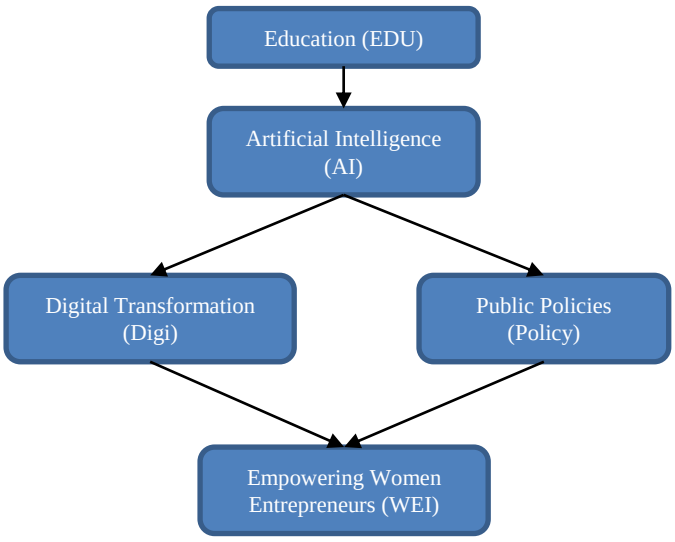

Figure 3. Structure of the SEM model

Figure 3 presents the impact of AI on empowering women entrepreneurs (WEI). DIGI is a mediating variable, indicating that AI affects businesses through digital transformation. This figure also shows education (EDU) in AI, along with its indirect impact on DIGI through strengthened women's digital and managerial skills. Public policies (POLICY) also support this process through public measures that encourage women's participation in entrepreneurship, where these women have begun to engage more in recent years and grow their businesses.

Based on the results presented in Table 7, the increased use of AI significantly increases digitalization in businesses, while education supports this process. The results of digital transformation are significantly impacted by AI, as shown in Table 7, where the coefficient is 0.7362 ($p < 0.01$). One of the key drivers of business digitalization among women-led firms is the deployment of AI, according to this. A considerable correlation between education and the ability to embrace and apply AI-based products (0.1827; $p < 0.01$) indicates that women who possess excellent digital and managerial skills are more likely to do so. This research proves that women-led enterprises can benefit from both artificial intelligence and education when it comes to digital transformation.

Table 7. SEM model results (equation 1)

Variables	Coefficient	Std. Error	P-value
AI	0.7362	0.0253	0.0000
EDU	0.1827	0.0418	0.0001
Const.	5.1243	0.7321	0.0000

$R^2 = 0.81$

Table 8. SEM model results (equation 2)

Variables	Coefficient	Std. Error	P-value
AI	0.1648	0.0321	0.0000
DIGI	0.2856	0.0412	0.0000
POLICY	0.2143	0.0809	0.0080
Const.	1.9024	0.6441	0.0043

$R^2 = 0.73$

The results presented in Table 8 show that digital transformation (DIGI) is a key channel through which artificial intelligence empowers women entrepreneurs. Based on the results presented in this table, it is seen that the direct effect of AI on WEI is strong. Still, the indirect effect through digitalization is even greater, which shows that in order to achieve long-term results in women's empowerment, investments in AI must be accompanied by digitalization and training programs. Meanwhile, public policies (with a positive and significant coefficient) facilitate the inclusion of women in technology by creating a favourable environment. In conclusion, the SEM model confirms the existence of an intermediary mechanism linking AI and women's empowerment through digitalization. In practical terms, this means that the more women and their businesses adopt advanced digital technologies, the greater the impact of AI on their economic and social empowerment.

Based on the results presented in Table 9, we note that the DID coefficient (0.2184) is positive and significant, which means that public policies adopted after 2019 in Albania, Kosovo and Serbia have significantly influenced the increase in the empowerment of women entrepreneurs, compared to other countries in the regions AI and DIGI continue to have significant positive effects, showing that even beyond policies, technology remains a fundamental factor in women's economic empowerment. The results of the DID model support the idea that public policies aimed at education, innovation, and digitalization have measurably increased women's participation in entrepreneurship. In particular, national programs that have included subsidies for women's start-ups, digital training centers, and gender-equality policies in business have created favorable conditions for sustainable, inclusive growth. Thus, the results are stable even when country- and year-fixed effects are included, controlling for external structural influences.

Table 9. Results of the Difference-in-Differences (DID) model

Variables	Coefficient	Std. Error	P-value
Post × Treated (DID)	0.2184	0.0719	0.0043
AI	0.1572	0.0251	0.0000
DIGI	0.1098	0.0324	0.0018
Const.	1.3024	0.5028	0.0120

$R^2 = 0.79$

The Difference-in-Differences (DID) analysis chose Kosovo, and Albania and Serbia as treatment countries because, after 2019, their economies embraced digital transformation and supported entrepreneurs more than the other Western Balkan countries that were part of the study. Public efforts to improve technology adoption and entrepreneurial development, as well as steps to stimulate innovation, digitalization programs for small and medium-sized enterprises (SMEs), and increased investments in digital infrastructure, were prominent after 2019. During the studied period, these countries made more noticeable progress in several areas, including the adoption of AI by businesses, digital governance initiatives, mechanisms to boost entrepreneurship, and digital training possibilities. The control nations were North Macedonia and Montenegro, which had lower levels of institutional support for women entrepreneurs and a slower rate of digital policy implementation compared to other countries in the region. Because of the way the groups were classified, we can compare the results of policies that encouraged digital transformation and entrepreneurship after 2019 to see whether they had different impacts on the empowerment of women entrepreneurs and the sustainability of their businesses in the Western Balkans.

The predicted impacts from the FE, SEM, and DID models are compared in Figure 4. Regardless of the econometric parameter, the visual comparison shows that public policy measures, digital transformation, and artificial intelligence all have a favorable impact on women entrepreneur empowerment. Policy changes beyond 2019 are crucial to bolstering digital inclusion and entrepreneurial viability in the Western Balkans, according to the DID projections.

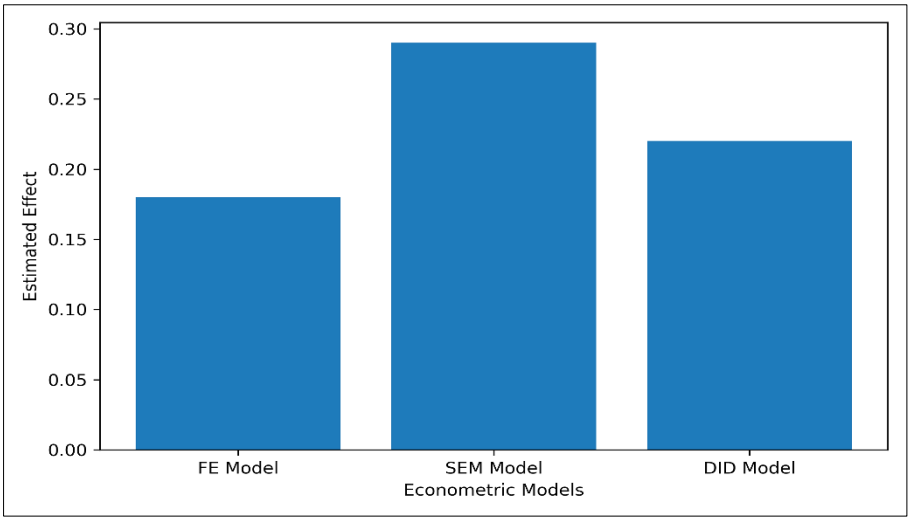

Figure 4. Comparison of FE, SEM, and DID Estimated Effects

The results presented in Table 10 show that all the main variables are statistically significant and have a positive impact. The result of AI (0.14) shows that there is a clear positive effect on women's empowerment. EDU (0.05) shows that education and training directly increase the skills for participation in the economy. Based on these results, the interaction term (AI×EDU) is positive and significant ($\beta = 0.0046$), indicating that the impact of AI on women's empowerment increases with higher education levels. This implies that education acts as a catalytic factor for the effects of artificial intelligence. This result highlights that the benefits of technological transformation depend not only on the technology itself but also on human skills, training, and preparation. In Western Balkan economies, where the digital skills gap remains significant, investing in education and training can help AI have a greater impact on the development of women entrepreneurs. The interaction model confirms that education and human capital play a key role in amplifying AI's impact. This means that public policies should not only focus on technological development, but also on digital training and educational programs that prepare women for the AI era.

Table 10. Results of the interaction model (AI × EDU)

Variables	Coefficient	Std. Error	P-value
AI	0.1425	0.0213	0.0000
EDU	0.0581	0.0274	0.0362
AI×EDU	0.0046	0.0017	0.0095
DIGI	0.1113	0.0338	0.0014
GDP	0.00037	0.00009	0.0003
INNOV	0.0429	0.0187	0.0251
POLICY	0.2183	0.0846	0.0110
Const.	1.2881	0.4215	0.0025

$R^2 = 0.88$, sightings: 60

This study provides empirical evidence that AI has become a key mechanism for empowering entrepreneurs, particularly women entrepreneurs, in the Western Balkans. The results obtained from the fixed-effects (FE) and Hausman–Taylor models indicate that AI adoption and use already have positive and significant effects on innovation and business performance, thereby supporting H3 and H4. The fixed-effects model is therefore highly suitable for analyzing digital transformation and business performance, as demonstrated by Han et al. [57]. The findings are also consistent with those of Koldovskyi et al. [58], who employed fixed-effects panel regression models and found that AI adoption improves efficiency, strengthens innovation capacity, and enhances business performance. These outcomes are particularly important for women-led businesses operating in transition economies characterized by limited stability.

The consistency between the present findings and previous studies suggests that AI adoption enhances operational efficiency, innovation capacity, and market competitiveness not only in developed economies but also in transition economies such as those of the Western Balkans. However, unlike previous studies that have focused mainly on large enterprises, the present study specifically emphasizes women-led businesses operating under structural and financial constraints. Similarly, Izmaku & Gashi [59] employed an ordinary least squares (OLS) model and found that digital transformation and the use of social media positively influence sales growth and the development of women-led businesses, while making access to international markets easier than in the past.

The Hausman–Taylor test also helps determine whether fixed-effects models are more appropriate for specific research questions. In studies examining the digital transformation of women entrepreneurs, this test helps identify whether individual heterogeneity dominates the data structure, as discussed by Utami et al. [60]. Moreover, the analyses presented above show that digital skills, access to finance, and education play major roles in promoting the development and adoption of AI, thereby emphasizing the importance of human capital and financial resources in the digital transformation and development process. These findings indicate that human capital and digital competencies remain necessary prerequisites for converting investments in artificial intelligence into long-term entrepreneurial success. This helps explain why countries with strong educational and digital infrastructures tend to have more empowered women entrepreneurs. Collectively, these findings support H1, H2, and H8.

Pantić et al. [61] showed that access to finance is one of the main barriers preventing women entrepreneurs from developing their businesses and competing effectively in competitive markets. This challenge becomes even greater when women lack formal collateral, which is required by most traditional financial institutions. Another major challenge faced by women entrepreneurs is digital literacy, which has become an essential skill for entering international markets and competing effectively. The most significant challenges identified include the basic use of digital tools, content creation, social media marketing, and the development, deployment, and implementation of online-platform strategies for business growth and competitive positioning, as reported by Luthfia et al. [6].

The results of the structural equation modeling (SEM) analysis presented in Tables 7 and 8 show that AI affects the empowerment of women entrepreneurs not only directly but also indirectly through increased innovation and improved business performance. These findings confirm H5, which states that AI adoption positively affects business performance; H6, which proposes that improved business performance positively influences the empowerment of women entrepreneurs; and H7, which states that AI adoption indirectly affects women's empowerment through improved business performance. These results are consistent with those of Hidayana & Noor [62] and Anjum et al. [63], who reported that artificial intelligence positively influences business performance. Even when business performance is initially weak but undergoing improvement, AI can help businesses achieve better organizational outcomes and generate multiple benefits. Mahmood et al. [64] similarly highlighted that AI positively affects business performance, which subsequently produces other organizational benefits.

Shunmugasundaram [65] also employed an SEM model to investigate women entrepreneurs and AI, finding that business performance significantly affects the empowerment of women entrepreneurs and the development of their businesses. Similarly, research conducted on women entrepreneurs during the digital transformation period reported positive effects on business performance. Istrefi et al. [66] further showed that combining marketing activities with AI generates even better outcomes for women-led businesses. Thus, the present results demonstrate that AI acts as a structural catalyst that enhances the competitiveness of women-owned businesses in their respective markets, thereby improving their economic and social positions.

The interaction model between AI and education (AI × EDU) shows that the effect of innovation on business performance is significantly stronger in environments where women possess higher levels of education and digital competence, thereby supporting H10. This finding suggests that technological improvements alone, without parallel investment in human capital, are insufficient to generate sustainable long-term benefits [67]. The results are consistent with those of Noor & Zainuddin [62], who found that women with advanced digital education and continuous training demonstrate a greater ability to use artificial intelligence tools to achieve competitive advantages than women without such educational backgrounds. In markets where women have received advanced education and training, particularly in business-related fields, their enterprises consistently achieve higher returns on investment, as reported by Madhu & Pujari [68].

The results of the Difference-in-Differences (DID) analysis show that institutional changes implemented after 2019 were associated with measurable improvements in the economic outcomes of women-led businesses, reflecting the strengthening of women's role in entrepreneurial activity. The DID findings also indicate that digital-support policies and institutional improvements introduced after 2019 were crucial in enhancing the sustainability of entrepreneurial businesses. This finding is particularly significant for transition economies, where institutional support and access to digital infrastructure remain inconsistent. These results suggest that the new policy frameworks have contributed to creating a more supportive environment for business modernization and increasing women's inclusion in formal economic structures.

Overall, this study contributes to the existing body of knowledge by providing the first comprehensive set of empirical evidence linking AI adoption, innovation, business performance, and the empowerment of women entrepreneurs in the Western Balkans, a region that has historically received limited research attention.

5. Conclusion

The purpose of this research was to analyze the impact of digital transformation, innovation, human capital, and artificial intelligence (AI) on women's entrepreneurship and economic empowerment in the Western Balkans from 2010 to 2025. Researchers looked at the direct and indirect links between AI adoption, digital transformation, company performance, and women entrepreneur empowerment using an integrated empirical framework that included Fixed Effects (FE), Hausman-Taylor estimation, Structural Equation Modeling (SEM), Difference-in-Differences (DID), and interaction models. The results showed that artificial intelligence has a favorable and statistically significant impact on innovative capacity, company performance, and the advancement of female entrepreneurs. When looking specifically at women-led firms, the results showed that digital skills, education, and financial accessibility greatly enhance the effectiveness of AI adoption. Additionally, the SEM analysis validated that digital transformation is a key mediator of the ways in which AI promotes empowerment and sustainability in the entrepreneurial sector. According to the study and the DID analysis, women entrepreneurs in the region were positively impacted by public policies and digital transformation initiatives after 2019. The results of this study highlight the importance of digital infrastructure, innovation policies, entrepreneurship support programs, and institutional backing for women-led businesses in emerging markets. Human capital is crucial to the creation of technology-driven entrepreneurs, and the interaction model proved that AI has a greater influence in settings with higher levels of education and digital competencies.

This study adds to the current body of knowledge by offering a unique perspective on the Western Balkans through its comprehensive empirical assessments of AI adoption, creativity, company performance, and the empowerment of women entrepreneurs. The current research emphasizes the significance of digital transformation led by artificial intelligence in transition economies that are facing structural and institutional issues, in contrast to numerous other studies that have mostly concentrated on developed economies. Despite this, there are several caveats to the study that should be considered. For example, the data on digital entrepreneurship is only available for specific years and indicators, and the sample size is rather small compared to other regions. The long-term consequences of AI adoption for equitable and sustainable entrepreneurial development can be further understood by expanding the analysis to include more developing economies, micro-level business data, and sector-specific analyses in future studies.

5.1. Recommendations

The study's empirical results provide a solid foundation for a number of policy and practical suggestions meant to encourage digital transformation and female entrepreneurship in the Western Balkans. To start, there has to be a greater investment in digital infrastructure, training programs for artificial intelligence, and programs to encourage female entrepreneurs. Women business owners would be better equipped to compete in today's technology-driven marketplaces if they had easier access to low-cost digital technology and innovation assistance programs.

Second, initiatives that aim to educate women business owners in innovation should focus on improving their digital literacy, artificial intelligence (AI) skills, and the ability to start and run successful businesses. According to the results of the interaction model, the beneficial effect of AI adoption on empowering entrepreneurs is amplified by education and digital skills. Hence, regional entrepreneurship strategies should center on programs that continuously expand capacity and provide business training with a focus on technology.

Third, digital finance initiatives, innovation awards, and technology-focused SME financing schemes should be supported by lawmakers to increase the accessibility of capital for businesses managed by women. When it comes to artificial intelligence (AI) and modernizing their businesses, women entrepreneurs in transition countries still face a significant obstacle: access to capital. Sustainable and technology-driven company growth can be fostered through more inclusive entrepreneurial ecosystems that are the result of increased cooperation between public and private sectors, including universities, innovation centers, and the private sector.

Last but not least, politicians in the Western Balkans should keep working on digital transformation plans with the long-term goal of narrowing economic gaps. For equitable economic development, entrepreneurial sustainability, and the long-term empowerment of women entrepreneurs in the region, it may be very helpful to strengthen institutional support, promote innovation ecosystems, and encourage SMEs to embrace AI.

6. Declarations

6.1. Author Contributions

R.G. and B.H.B. contributed to the design and implementation of the research, to the analysis of the results, and to the writing of the manuscript. All authors have read and agreed to the published version of the manuscript.

6.2. Data Availability Statement

The data presented in this study are available on request from the corresponding author.

6.3. Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

6.4. Institutional Review Board Statement

Not applicable.

6.5. Informed Consent Statement

Not applicable.

6.6. Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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