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ABSTRACT

This study examines the long-term effects of economic and social factors affecting entrepreneurial activities across Türkiye's NUTS1 regions between 2009 and 2022. Using the Fully Modified Ordinary Least Squares (FMOLS) methodology, the relationships among regional GDP growth, income inequality, unemployment rates, public education expenditures and early school leaving rates are analyzed. The results show that GDP growth and income inequality have a positive impact on entrepreneurial activities, whereas unemployment rate and public education expenditures have negative effects. Early school leaving rate is found to have a limited but positive effect on entrepreneurship. It explicitly links entrepreneurship to broader socio-economic dimensions, highlighting how factors such as income inequality, education, and unemployment shape entrepreneurial dynamics across regions. The findings reveal that economic and social factors play a multidimensional role in shaping entrepreneurship dynamics. By incorporating regional disparities and linking entrepreneurship with broader socio-economic dimensions, the study aligns with international literature on entrepreneurship and economic development. It also provides practical recommendations for policymakers, such as developing strategies to promote income equality, strengthening regional financial support mechanisms, and integrating entrepreneurship education into the national curriculum to foster sustainable development. This comprehensive analysis offers both insight into Turkey's regional entrepreneurship landscape and a framework for policymakers aiming to balance economic growth with social equity.

ÖZ

Bu çalışma, 2009-2022 yılları arasında Türkiye'nin İBBS1 bölgelerinde ekonomik ve sosyal faktörlerin girişimcilik faaliyetleri üzerindeki uzun vadeli etkilerini araştırmaktadır. Araştırma, Tamamen Değiştirilmiş En Küçük Kareler (FMOLS) metodolojisini kullanarak bölgesel GSYH büyüme oranı, gelir eşitsizliği, işsizlik oranı, kamu eğitim harcamaları ve erken okul terk oranları arasındaki ilişkileri incelemektedir. Sonuçlar, GSYİH büyümesi ve gelir eşitsizliğinin girişimcilik faaliyetleri üzerinde olumlu bir etkisi olduğunu ortaya koyarken, işsizlik ve kamu eğitim harcamaları olumsuz etkiler göstermektedir. Özellikle, okulu erken bırakanlar girişimcilik üzerinde sınırlı ancak olumlu bir etki sergilemektedir. Çalışma, girişimciliği gelir eşitsizliği, eğitim ve işsizlik gibi faktörler aracılığıyla daha geniş sosyo-ekonomik boyutlarla açık bir şekilde ilişkilendirmektedir. Bu bulgular, girişimcilik dinamiklerinin şekillenmesinde ekonomik ve sosyal faktörlerin çok yönlü rolünü vurgulamaktadır. Çalışma, bölgesel farklılıkları ele alarak ve girişimciliği daha geniş sosyo-ekonomik boyutlarla ilişkilendirerek, girişimcilik ve ekonomik kalkınma üzerine yapılan uluslararası çalışmalarla uyum sağlayarak literatüre katkıda bulunmaktadır. Pratik öneriler arasında bölgesel mali destek mekanizmalarının güçlendirilmesi, gelir dağılımında eşitliğin teşvik edilmesi ve sürdürülebilir kalkınmayı teşvik etmek için girişimcilik eğitiminin ulusal müfredata entegre edilmesi yer almaktadır. Bu kapsamlı analiz, Türkiye'nin bölgesel girişimcilik ortamına dair içgörüler sunmanın yanı sıra ekonomik büyüme ile sosyal eşitliği dengelemeyi amaçlayan politika yapıcılar için de bir çerçeve sunmaktadır.

INTRODUCTION

In contemporary economic thought, entrepreneurship is increasingly viewed not merely as a profit-driven activity, but as a dynamic and multidimensional process contributing to sustainable development, social transformation, and innovation ecosystems. Recent research highlights entrepreneurship's role in recognizing opportunities, generating social and environmental value, and engaging with regional and global economic systems (Urbano et al., 2019; Méndez-Picazo et al., 2021; Gu et al., 2022). This modern perspective underscores the growing relevance of entrepreneurship in achieving sustainability goals, promoting social inclusion, and enhancing regional resilience.

Classical theories such as Schumpeter's (1934) notion of "creative destruction" and Kirzner's (1973) model of opportunity discovery laid the foundation for understanding entrepreneurial dynamics. Schumpeter emphasized innovation as a driver of economic transformation, while Kirzner focused on the entrepreneur's role in identifying and correcting market inefficiencies. While these frameworks offer historical depth, today's complex economic and social challenges require expanded definitions of entrepreneurship that integrate innovation, sustainability, and social impact into policy and practice.

The contribution of entrepreneurship to economic growth is multidimensional. The establishment of new businesses increases competition in product markets and ensures the efficient allocation of resources (Carree and Thurik, 2005). In addition, entrepreneurial activities pave the way for productivity growth by promoting technology transfer and innovation (Wong et al., 2005). However, the level of these effects may differ across regions depending on the nature of economic and social factors.

Audretsch and Thurik (2004) emphasized that entrepreneurship not only increases economic performance but also contributes to social welfare by providing opportunities for regional development. In developing countries like Türkiye, entrepreneurship is critical not only to accelerate economic growth, but also to reduce income inequalities and increase economic opportunities. Therefore, analyzing the relationship between entrepreneurship and economic and social factors is an important step to develop effective policy recommendations for regional development and social welfare.

This study aims to examine the effects of economic and social factors on entrepreneurial activities within the framework of Türkiye's regional development disparities. By considering social factors such as income inequality, public education expenditures, unemployment rate and early school dropout rate, as well as Gross Domestic Product (GDP) growth rates as an indicator of economic performance, the dynamics of entrepreneurial activities in Türkiye's Nomenclature of Units for Territorial Statistics Level 1 (NUTS1) regions are evaluated. Türkiye's highly heterogeneous structure in terms of economic and social indicators provides a unique opportunity to analyze the relationship of entrepreneurial activities with such factors. Such a Türkiye-specific study can provide important implications not only for regional development policies but also for other countries with similar characteristics. This study provides a multidimensional analysis by linking entrepreneurship dynamics not only with economic indicators but also with social factors. Addressing the effects of social factors such as income inequality, education expenditures and unemployment on entrepreneurship will help policy makers to develop more comprehensive solutions.

In the literature, economic conditions and social structure are the main factors affecting the entrepreneurship unit. For example, Gür (2017) stated that the level of economic development is a determining factor in the intensity of innovative entrepreneurship. Likewise, a study conducted by Amaghouss and Ibourk (2013) showed that improvements in social structure increase entrepreneurial productivity. In the case of Turkiye, the impact of institutional support mechanisms such as KOSGEB (Small and Medium Enterprises Development Organization) on regional development is analyzed by Demirtaş (2020), and it is shown that these supports make a significant contribution to economic growth. For example, official statistics indicate that the number of participants in KOSGEB's entrepreneurship training programs increased significantly from 2015 onwards, reaching a

peak of over 220,000 individuals in 2017. This number declined during the 2018–2020 period—reaching its lowest point in 2020, likely due to the pandemic—and partially recovered in 2021 and 2022, with figures stabilizing around 155,000 participants. These trends reflect the structural role of KOSGEB in promoting entrepreneurship and also underscore how broader macroeconomic and public health conditions can influence participation in support programs. Including such institutional dimensions provides an important contextual layer when evaluating regional entrepreneurship dynamics in Turkiye.

Entrepreneurial activities not only accelerate economic growth, but also promote social development through job creation and innovation. Particularly in developing countries such as Türkiye, supporting entrepreneurial activities is crucial for reducing income inequalities and increasing economic opportunities. However, regional disparities can be an obstacle for entrepreneurial activities to realize their full potential. Therefore, analyzing the effects of both economic and social factors on entrepreneurship is a critical step in developing effective policy recommendations.

Although various studies have investigated the determinants of entrepreneurship globally, there remains a significant gap in the Turkish literature regarding comprehensive, multi-variable analyses. Existing studies in Türkiye often limit their scope to one or two explanatory variables—such as unemployment or regional income—without examining the broader interaction between economic and social dynamics. Furthermore, many of these studies focus on the national level and lack either regional detail or long-term analytical depth. This study addresses that gap by simultaneously analyzing five key variables—regional income inequality, unemployment, early school leaving, public education expenditure, and GDP growth—across Türkiye's NUTS1 regions over a 16-year period, providing a more holistic and regionally differentiated understanding of entrepreneurship dynamics in the country.

In addition, by situating entrepreneurship within the framework of regional disparities, this study contributes empirical insights to the existing literature. The effects of regional development differences on entrepreneurship provide a concrete foundation for designing targeted and effective entrepreneurship support programs at the regional level. The key methodological contribution of this study lies in its use of the Fully Modified Ordinary Least Squares (FMOLS) method to analyze the long-run effects of economic and social factors on entrepreneurial activity. This approach overcomes the stationarity issues in panel data analysis and delivers robust results regarding long-term relationships.

The five variables selected in this study were chosen based on their theoretical relevance and empirical importance in both global and Turkish contexts. Regional income inequality can influence opportunity recognition and access to capital; unemployment is commonly linked to necessity entrepreneurship; early school leaving serves as a proxy for human capital limitations; public education expenditure reflects long-term investment in human capacity building; and GDP growth indicates the overall economic environment in which entrepreneurship develops. Together, these variables allow for a comprehensive assessment of both opportunity- and necessity-driven entrepreneurship mechanisms, making them particularly well-suited for understanding the heterogeneous nature of regional entrepreneurial activity in Türkiye.

The significance of this study is that it provides a multidimensional understanding of entrepreneurship by integrating both economic and social factors, and offers region-specific insights that can inform targeted policy interventions in Türkiye and similar contexts.

THEORY AND LITERATURE REVIEW

Entrepreneurship has been an important area of research in the global literature due to its multidimensional effects on economic development and social development. This field has attracted attention with its multidimensional benefits such as economic innovation, job creation, increasing social welfare and accelerating regional development. Schumpeter's (1934) concept of "creative destruction" has been one of the main theories in the literature, explaining how entrepreneurship transforms economic structures through innovative approaches. Schumpeter argues that entrepreneurship is the main source of economic dynamism and competition. Entrepreneurs move the economy from

a static equilibrium to a continuous process of innovation and growth. According to him, entrepreneurs tear down the existing economic structure and build a new one. This process enables less efficient systems to be replaced by more innovative and efficient ones. For example, the replacement of horse-drawn carriages by automobiles is an example of creative destruction. For Schumpeter, entrepreneurs are the catalysts of economic development, leaders who take risks, innovate and transform markets. They play a critical role in the economy's transition from static equilibrium to a dynamic structure. This concept forms the basis of today's studies and is considered as an important catalyst of economic development.

Kirzner (1973) discussed the concept of entrepreneurship within the framework of the Austrian School of Economics and presented an alternative approach to Schumpeter's innovative entrepreneur model. According to him, entrepreneurship is an activity that involves recognizing imbalances in market processes and closing these gaps. Kirzner's entrepreneur increases efficiency in the economic system as a result of competition in market processes. In this approach, the entrepreneur improves economic balances by better organizing existing resources rather than innovating. These theories present different perspectives on entrepreneurship as a critical tool for both economic growth and social development. While Schumpeter represents an innovation and change-oriented approach, Kirzner presents a more balanced and opportunity-based framework. This diversity provides a rich perspective for understanding the social and economic impacts of entrepreneurship.

Entrepreneurship has been extensively analyzed in the literature due to its significant contributions to economic and social development. Early studies, such as Hoselitz (1952), emphasized the role of human resources in entrepreneurship, highlighting how they support economic development by fostering skills and innovation. Wennekers and Thurik (1999) expanded on this by arguing that entrepreneurship contributes to the economy through job creation and increased competition, establishing a link between entrepreneurial activities and overall economic growth. Building on this, Carree and Thurik (2005) explored how innovation-based ventures not only enhance economic productivity but also promote regional development. However, they noted that the magnitude of these effects is contingent on factors such as the social and cultural environment, institutional structure, and prevailing economic conditions. Acemoglu and Robinson (2008) provided a deeper understanding of the importance of institutional structures in fostering economic development. They emphasized that well-designed institutional frameworks amplify the effectiveness of entrepreneurial activities, enhancing their contribution to economic growth. Further exploring the role of institutional factors, Urbano et al. (2019) underscored how institutional quality serves as a critical tool for promoting entrepreneurship. Acs et al. (2012) later introduced the concept of entrepreneurial capital, highlighting its decisive role in shaping the economic performance of countries.

In more recent studies, Aparicio et al. (2016) analyzed opportunity-based entrepreneurship in Latin America, revealing that its success depends heavily on levels of economic development and social capital. Doran et al. (2018) investigated the relationship between social entrepreneurship and sustainable development goals, highlighting the indirect economic benefits of social innovation. Drawing from Schumpeterian approaches,

Stoica et al. (2020) analyzed the impact of entrepreneurship on economic growth in European countries. In the study, it was stated that innovative entrepreneurship is a factor that promotes economic growth and that this effect may vary depending on the institutional quality across countries. These findings draw attention to the importance of designing entrepreneurship policies to support innovation. Neumann (2020) conducted a systematic review of the effects of entrepreneurship on economic, social and environmental well-being. The study emphasized that entrepreneurship contributes positively to macroeconomic development, but that this relationship is complex and context-sensitive. This result suggests that entrepreneurial activities may vary according to the diversity in the social and economic structure. Similarly, Méndez-Picazo et al. (2021) examined the socio-cultural and economic factors influencing entrepreneurship, concluding that these interactions promote sustainable development. Van Rijn et al. (2021) focused on the

motivations of social entrepreneurs to measure their social impact. The study demonstrated the decisive role of innovation and social mission on these impacts, showing that social entrepreneurship strengthens the capacity to solve social problems. These findings suggest that social entrepreneurship is compatible with sustainable development goals. Gu et al. (2022) examined the relationship between entrepreneurship, economic policy uncertainty and sustainability. The study showed that green entrepreneurship contributes to social development and environmentally friendly innovations support sustainable development goals within the economic system. Borah and Bhowal (2023) examined the multidimensional effects of entrepreneurship on economic growth and sustainable development. The study emphasizes that entrepreneurial activities can provide both economic and environmental benefits and that innovative approaches at the policy level can enhance these effects.

When examining the literature on entrepreneurship in Türkiye, various studies highlight its effects on regional development and economic growth. Emhan (2011) investigated the impact of terrorism and violence on entrepreneurs in Eastern and Southeastern Anatolia. The study emphasized the significant challenges entrepreneurs face due to violence and economic uncertainties, revealing how these factors hinder entrepreneurial activities in the region. Arslan and Tatlıdil (2012) explored the relationship between entrepreneurship activities and cultural dynamics in Türkiye, analyzing the effects of social norms that either encourage or restrict entrepreneurship. This study underscored the importance of cultural values in shaping entrepreneurial ecosystems. Turgut and Akgün (2015) examined the relationship between entrepreneurship and regional economic growth in Türkiye. Their findings showed that the effects of entrepreneurship on regional development vary significantly across regions, with eastern areas benefitting less from entrepreneurial activities compared to other parts of the country. Gür (2017) analyzed the impact of economic development on innovative entrepreneurship activities, highlighting that regional economic imbalances in Türkiye are a critical factor determining the effectiveness of these activities.

Apaydin (2018) focused on the relationship between entrepreneurship, innovation activities, and economic cycles in Türkiye. The study revealed that innovation activities tend to increase during periods of economic growth, while entrepreneurship activities rise during economic stagnation, offering valuable insights into the interplay between economic cycles and entrepreneurial behavior. Şahin and Akça (2019) emphasized the importance of social capital and cultural factors in developing Türkiye's entrepreneurial ecosystem. They argued that these elements should be further strengthened to foster sustainable entrepreneurship development. Tunali and Şener (2019) analyzed entrepreneurship determinants in Türkiye using data from the Global Entrepreneurship Monitor. They demonstrated how individuals' demographic characteristics and perceptions shape entrepreneurial tendencies, providing significant insights into the micro-level dynamics of entrepreneurship. Demirtaş (2020) examined the role of KOSGEB supports in encouraging entrepreneurship and economic growth. The study highlighted that such supports become particularly crucial during crises, like pandemics, and recommended restructuring these programs to address regional needs effectively. Kaya and Aydoğdu (2021) assessed the impact of entrepreneurship policies on economic growth in Türkiye. Their research emphasized the need for well-designed public policies that prioritize and promote innovative entrepreneurship.

Karagöz (2022) investigated the relationship between entrepreneurship activities and employment in Türkiye. The findings showed that while entrepreneurship has a positive impact on employment in the long run, its direct effect on reducing unemployment is weaker than anticipated. This points to the need for more effective entrepreneurship support mechanisms. Finally, Sipahi Dongul and Artantaş (2022) explored the relationship between social entrepreneurship behavior and Small and Medium-sized Enterprises (SMEs) performance in Türkiye. They found that social entrepreneurial behaviors significantly enhance organizational performance, with this relationship strengthened by social ties and entrepreneurial leadership. This study makes an important contribution to understanding the link between social entrepreneurship and business performance.

In the literature, entrepreneurship is seen as a driver of both economic growth and social development at the global and local level. While global studies have strongly demonstrated the relationship between entrepreneurship and innovation and sustainable development, studies in the Turkish context have focused on its relationship with regional inequalities, social factors and institutional support mechanisms. In particular, the need to make policies that promote entrepreneurship in Türkiye more effective, reduce regional imbalances and strengthen social capital is emphasized. In this framework, entrepreneurship should be considered not only as an economic tool but also as a powerful mechanism for social transformation. Both global and local literature make it clear that entrepreneurship ecosystems need to be strengthened.

DATA AND METHOD

Table 1 presents the variables used in the study, their abbreviations, measurement metrics and data sources. In this study, seven key variables are used to analyze the economic and social factors affecting entrepreneurial activities in the NUTS1 level regions of Türkiye: Entrepreneurial Activity (EA), Regional GDP Growth Rate (GDP), Income Inequality (GINI), Unemployment Rate (UN), Public Education Expenditure (EDUC) and Early School Leavers (LEFT). The NUTS1 region is the Turkish version of a classification system established by the European Union to ensure comparability of regional statistics. The NUTS classification is determined by the Turkish Statistical Institute (TurkStat). The NUTS1 level represents the broadest regional level and consists of 12 main regions. Istanbul is a region on its own. Western Marmara (Tekirdağ, Edirne, Kırklareli, Balıkesir, Çanakkale), Aegean (İzmir, Aydın, Muğla, Denizli, Manisa, Afyonkarahisar, Kütahya, Uşak), Eastern Marmara (Bursa, Eskişehir, Bilecik, Kocaeli, Sakarya, Düzce, Bolu, Yalova), Western Anatolia (Ankara, Konya, Karaman) and Mediterranean (Antalya, Isparta, Burdur, Adana, Mersin, Hatay, Osmaniye, Kahramanmaraş) are among the prominent regions.

Other regions are Central Anatolia (Kırıkkale, Aksaray, Niğde, Nevşehir, Kırşehir, Kayseri, Sivas, Yozgat), Western Black Sea (Zonguldak, Karabük, Bartın, Kastamonu, Çankırı, Sinop), Eastern Black Sea (Trabzon, Ordu, Giresun, Rize, Artvin, Gümüşhane), Northeastern Anatolia (Erzurum, Erzincan, Bayburt, Ağrı, Kars, Iğdır, Ardahan), Central Anatolia (Malatya, Elazığ, Bingöl, Tunceli, Van, Muş, Bitlis, Hakkari) and Southeast Anatolia (Gaziantep, Adıyaman, Kilis, Şanlıurfa, Diyarbakır, Mardin, Batman, Şırnak, Siirt). This classification serves as a guide for regional development and planning studies. The data cover the period 2009-2022 and are collected at annual frequency.

Entrepreneurial Activity (EFA) represents the number of newly established enterprises, while the Income variable represents the regional GDP growth rate. Income Inequality (GINI) is used to measure income distribution in society. Unemployment and Public Education Expenditure on Education are considered as social factors. In addition, Early School Leavers variable is included in the model as critical variables in analyzing the effects on education system. The variable Early Leavers from Education and Training (LEFT) is derived from Eurostat and refers to the percentage of the population aged 18 to 24 who have attained at most lower secondary education and are not involved in any further education or training during the reference period. It is a commonly used indicator to measure the effectiveness and inclusiveness of national education systems. This indicator is interpreted as a proxy for educational disengagement and often reflects structural weaknesses in school-to-work transition policies. In the analysis, linear relationships are better modeled by taking the natural logarithm of entrepreneurial activities.

Table 1: Definitions on variables and sources

Variables	Symbol	Metric	Source
Entrepreneurial Activities	EA	Number of newly established enterprises	TurkStat (2024)
Income	GDP	Regional GDP growth rate (%)	TurkStat (2024)
Income Inequality	GINI	GINI Coefficient	TurkStat (2024)
Unemployment Rate	UN	Annual unemployment rate (%)	TurkStat (2024)
Public Education Expenditures	EDUC	Education expenditures as % of GDP	EuroStat (2024)
Early Leavers[4]	LEFT	Early school leaving rate (%)	EuroStat (2024)

Table 2 presents the descriptive statistics of the variables used in the study. Variables such as entrepreneurial activities, regional GDP growth rate, income inequality, unemployment rate, public education expenditures and early school leavers illustrate the diversity of economic and social factors considered in the study. The averages of the variables reflect the general economic and social trends in the NUTS1 level regions of Türkiye during the analyzed period. In particular, variables such as income inequality and public education expenditures exhibit low variation, suggesting that regional differences in these areas are limited. On the other hand, wide ranges in variables such as unemployment and early leavers dropout rates suggest that regional differences are significant. These statistics contribute to a more in-depth analysis of the relationships addressed in the model.

Table 2: Descriptive statistics

Variables	Obs	Mean	Std. Dev	Min.	Maks.
EA	168	12.377	0.735	10.999	13.951
GDP	168	4.802	4.419	-7.500	15.700
GINI	168	0.369	0.024	0.316	0.445
UN	168	10.082	3.406	3.500	22.300
EDUC	168	0.347	0.042	0.162	0.427
LEFT	168	34.028	11.556	11.800	65.800

The analysis methods used in our study include panel unit root tests, cointegration tests and long-run estimation methods in order to understand the time and cross-sectional dynamics of the panel data set.

In panel data analysis, testing whether the variables are stationary is critical for the accuracy of the methods to be applied. In this study, IPS (Im et al. 2003) and Breitung (2000) tests are used as panel unit root tests. While the IPS test assumes different autoregressive structures for each unit in heterogeneous panel data, it tests the first difference stationarity assumption. In our study, the flexibility provided by this test is important as Türkiye's NUTS1 regions exhibit different economic and environmental structures. The test statistic is expressed as follows:

$$t_{IPS} = \frac{1}{N}\sum_{i=1}^{N} t_i \qquad (1)$$

where t_i is the test statistic for the null hypothesis of stationarity of the autoregressive parameters for each cross-section. The Breitung test assumes that the series in the panel have a common autoregressive parameter, which leads to more robust results, especially in small samples. Moreover, it can more accurately detect the stationarity of the series under the assumption of a common autoregressive parameter. It is determined that the variables in our panel data set do not contain unit roots and should be stationary.

4 A potential limitation of using this indicator in a year-by-year panel analysis of entrepreneurship lies in the temporal dynamics of the entrepreneurial process. Individuals recorded as "early leavers" in year t are likely to have left formal education before that year and may have already engaged in entrepreneurial activity prior to t. In this regard, there may be a lag effect between leaving school and starting a business. While our dataset does not include individual-level longitudinal tracking, the LEFT variable still provides meaningful regional-level variation that reflects broader socio-educational environments. Future research could enhance this relationship by incorporating lagged variables or individual panel data where available.

Panel cointegration tests were applied to examine the long-run relationships between the variables. Pedroni (1999) and Kao (1999) cointegration tests were used in the study. The Pedroni cointegration test is an approach that allows for heterogeneity across cross-sectional units and is based on multiple regression equations. The test was conducted within the framework of the following model:

$$y_{it} = \alpha_i + \delta_i t + \beta x_{it} + \epsilon_{it} \quad (2)$$

where represents the dependent variable and represents the independent variables. The Pedroni test tests for cointegration by checking whether the error term is stationary. According to the results of this test, which is analyzed with various statistics, it is determined that there is a long-run relationship between the variables (Pedroni, 1999).

The Kao test is applied under the assumption of homogeneous cross-section to verify whether there is cointegration between the series. The test is based on the stationarity analysis of the following error terms:

$$\epsilon_{it} = \rho \epsilon_{it-1} + u_{it} \quad (3)$$

A coefficient less than one indicates the presence of cointegration. The Kao test assumes that all units in the panel have common autoregressive parameters. This test offers a simpler structure compared to the Pedroni method and is used as a supportive tool for cointegration results. The test results confirmed a strong cointegration relationship between the variables (Kao, 1999).

Once cointegration is detected, the FMOLS method (Pedroni, 2000) is used to estimate the long-run coefficients between the variables. The FMOLS method produces more reliable results in small samples by correcting the biases in classical estimation methods. This provides more reliable estimates by taking into account possible correlations between independent variables and error terms. The FMOLS method allows for heterogeneity across cross-sectional units, which is compatible with the specific economic structures of different regions. The FMOLS method is expressed as follows:

$$\hat{\beta}_{FMOLS} = \left(\sum_{i=1}^{N} X'_{it} X_{it} \right)^{-1} \sum_{i=1}^{N} X'_{it} \left(y_{it} - \hat{\gamma}_{it} \right) \quad (4)$$

Here is a correction term for the joint effect of the error terms and independent variables. Studies such as Pedroni (2000) and Gülmez and Yardımcıoğlu (2012) show that the FMOLS method yields effective results even in small samples. This feature is very important for the panel data set used in our study. FMOLS is an optimal method for long-run coefficient estimation in models that assume cointegration. This allows us to obtain more accurate results, especially when analyzing the effects of economic and environmental factors on food security. The FMOLS method has reliably estimated the long-run relationships between variables, taking into account the heterogeneity across cross-sectional units in panel data analysis (Pedroni, 2000).

The preference for these methods was made both to strengthen the stationarity and cointegration analyses in the panel data set and to estimate the long-run relationships between variables in the most accurate way. While IPS and Breitung tests provide a solid basis for understanding the basic properties of panel data, Pedroni and Kao cointegration tests reveal the long-run links between variables. Finally, the long-run coefficients obtained with the FMOLS method enhance the capacity of our study to develop policy recommendations.

EMPIRICAL RESULTS

Table 3 summarizes the IPS and Breitung panel unit root test results. Although the level values of the series contain unit roots, they are stationary at 5% significance level when first differences are taken.

Table 3. Panel unit root test results

Variables	IPS		Breitung	
	I(0)	I(1)	I(0)	I(1)
EA	9.072 (0.999)	-2.918 (0.002)	10.686 (0.999)	-1.915 (0.028)
GDP	-8.071 (0.000)	-10.222 (0.000)	-2.908 (0.002)	-4.133 (0.000)
GINI	-3.597 (0.000)	-7.903 (0.000)	-0.285 (0.388)	-5.186 (0.000)
UN	-2.175 (0.015)	-4.366 (0.000)	-1.161 (0.123)	-6.811 (0.000)
EDUC	0.767 (0.779)	-4.251 (0.000)	1.423 (0.923)	-5.329 (0.000)
LEFT	-2.399 (0.008)	-7.940 (0.000)	-2.016 (0.022)	-4.611 (0.000)

The panel cointegration test results in Table 4 show that there is a long-run relationship between the variables. In the analyses using Pedroni and Kao tests, the significant results of the test statistics support the existence of a long-term equilibrium relationship between entrepreneurial activities and economic/social factors. These findings suggest that the variables move together over time and the model allows for consistent long-run analysis. These results provide an important basis for understanding the effects of entrepreneurial activities on economic growth and social indicators in the long run.

Table 4. Panel cointegration test results

		statistics	Prob.
Pedroni Test	Panel PP	-1.968742	0.0245
	Panel ADF	-1.855868	0.0317
	Group PP	-2.571582	0.0051
	Group ADF	-3.261993	0.0006
Kao Test*	ADF	-2.046912	0.0203

* Lag length is chosen according to Schwarz information criteria. The Bartlett kernel method is used, and bandwidth is determined by Newey-West method.

Table 5 summarizes the Pearson correlation results in order to test whether there is a correlation between the horizontal cross-sections. The results show that there is a moderate positive correlation between Entrepreneurial Activity (EA) and Income Inequality (GINI) and Unemployment Rate (UN) (0.415 and 0.394). This indicates that income inequality and unemployment rate may be important factors affecting entrepreneurial activities. On the other hand, there is a negative relationship (-0.381) between the Early Leavers (LEFT) variable and EE. This indicates that the decline in the level of education may negatively affect entrepreneurial activities.

The correlation values between the regional GDP growth rate (GDP) and other variables are quite low. This implies that GDP growth does not show a direct linear relationship with entrepreneurial activities or other social factors. No significant correlation was observed between the Public Education Expenditures (EDUC) variable and other variables; however, the indirect effects of education expenditures could be further analyzed in the analysis.

The Pearson correlation matrix shows that there is a certain level of linear relationship between the variables in the model. It is noteworthy that income inequality, unemployment rate and education-related variables have significant effects on entrepreneurial activities.

Table 5: Pearson correlation matrix

	EA	GDP	GINI	UN	EDUC	LEFT
EA	1.000					
GDP	0.110	1.000				
GINI	0.415	-0.066	1.000			
UN	0.394	-0.092	0.139	1.000		
EDUC	0.153	0.066	-0.002	-0.007	1.000	
LEFT	-0.381	0.051	-0.105	0.128	-0.150	1.000

The FMOLS estimation results presented in Table 6 reveal the long-run relationships between economic and social factors affecting entrepreneurial activities. The findings show that regional economic growth has a positive and significant effect on entrepreneurship. This result is an important finding in terms of economic expansion creating new opportunities and encouraging entrepreneurial activities. However, the limited impact of growth suggests that economic growth alone is not sufficient to support the entrepreneurial ecosystem and that other factors should also be taken into account.

Income inequality has a strong positive effect on entrepreneurial activities. Inequalities in income distribution can have a boosting effect on entrepreneurial activity by encouraging individuals to seek alternative sources of income. This suggests that entrepreneurship is seen as a way out, especially in regions where opportunities are limited. On the other hand, unemployment rate has a negative effect on entrepreneurship. This finding suggests that unemployment negatively affects individuals' decisions to start new businesses by increasing economic uncertainties. Therefore, it appears that policies to support entrepreneurship should be considered together with strategies to reduce unemployment.

The effect of education expenditures on entrepreneurship activities is found to be negative and significant. This suggests that education expenditures do not have a direct impact on entrepreneurship in the short run, but have the potential to create qualified human resources in the

long run. An increase in the level of education may lead individuals to prefer different career paths, leading to a decrease in entrepreneurial activities. In this context, it is important that education policies are redesigned to support an entrepreneurial culture.

Finally, the rate of early school leavers has a positive effect on entrepreneurship. This result suggests that individuals outside the education system turn to entrepreneurship activities to participate in the labor force. However, the limited level of this effect suggests that early school leaving does not play a strong enough role on sustainable entrepreneurial activities. Overall, the high explanatory power of the model suggests that economic and social factors provide an important framework for understanding change in entrepreneurial activity. These findings suggest that economic growth, equal opportunity and education policies need to be addressed in an integrated manner to develop the entrepreneurship ecosystem.

Tablo 6: FMOLS results

Dependent variable: ln(EA)				
Variables	**Coefficient**	**Std. Error**	**t-stat**	**p-value**
GDP	0.0013	0.0005	2.5564	0.0117
GINI	0.8237	0.0942	8.7453	0.0000
UN	-0.4826	0.0749	-6.4444	0.0000
EDUC	-0.0125	0.0031	-4.0358	0.0000
LEFT	0.0021	0.0010	2.0599	0.0413
R^2=0.94				
Adj. R^2=0.91				
Reg. Standard Error=0.05				

DISCUSSION

This study reveals the dynamics of the entrepreneurship ecosystem by analyzing the long-run relationships of economic and social factors affecting entrepreneurial activities in NUTS1 regions of Türkiye. Consistent with the broader literature, the findings highlight how regional GDP growth, income inequality, unemployment rate, public education expenditures, and early school dropout rates exert differentiated influences on entrepreneurial activities.

The positive effect of GDP growth on entrepreneurship aligns with previous findings by Carree and Thurik (2005) and Audretsch and Thurik (2004), who emphasize the catalytic role of economic expansion in stimulating entrepreneurial opportunities. However, the relatively modest magnitude of this effect implies that economic growth, while beneficial, is insufficient on its own to sustain a robust entrepreneurial ecosystem.

Income inequality shows a strong positive relationship with entrepreneurial activity. This supports prior studies such as Gür (2017) and Amaghouss and Ibourk (2013), suggesting that in contexts of unequal income distribution, individuals may be more inclined to pursue entrepreneurship as an alternative route to economic mobility. Nonetheless, while inequality-driven entrepreneurship may indicate necessity-based initiatives, it underscores the importance of ensuring that entrepreneurship is supported as a creative, opportunity-oriented process rather than merely a response to hardship.

The negative impact of unemployment on entrepreneurship confirms the deterrent effect of economic uncertainty. As supported by Wong et al. (2005), regions with high unemployment may experience reduced entrepreneurial engagement due to heightened risk aversion among potential entrepreneurs. These findings underscore the need for integrating entrepreneurship support with broader labor market strategies aimed at reducing unemployment.

A more nuanced result is the negative effect of public education expenditure on entrepreneurship. In the short run, increased educational investment may divert individuals toward non-entrepreneurial career paths, reducing the appeal of starting a business. Yet, as emphasized by Şahin and Akça (2019), education remains essential in the long term for cultivating a qualified, innovation-capable workforce. Thus, there is a need to align educational content with entrepreneurship-oriented competencies to convert potential into active entrepreneurial engagement.

Finally, early school leaving is found to have a small but positive effect on entrepreneurship, suggesting that disengaged youth may turn to self-employment in the absence of formal educational or career opportunities. However, the limited size of this effect again signals that sustainable entrepreneurship cannot be rooted in early educational disengagement. Rather, strengthening inclusive, quality education may better support long-term entrepreneurial development.

CONCLUSION

The results of this study confirm that entrepreneurial activity in Türkiye's regions is shaped by a complex interaction of economic and social factors. These findings echo prior international work, such as that by Amaghouss and Ibourk (2013) and Aparicio et al. (2016), emphasizing the need for a multidimensional approach to understanding and promoting entrepreneurship.

To harness entrepreneurship for sustainable regional development, it is critical to implement integrated policies that target both economic expansion and social equity. Policymakers should focus on strengthening financial support mechanisms—such as low-interest SME loans and regional development incentives—to improve the entrepreneurial landscape, particularly in economically lagging regions. Simultaneously, reducing income inequality through accessible training, mentoring programs, and financial literacy initiatives can create a more inclusive entrepreneurial environment.

Moreover, reforming education policies to integrate entrepreneurship and innovation into curricula can better align public education with labor market realities. To mitigate early school leaving, investment in vocational education, youth employment pathways, and social support services is essential. These measures would not only support entrepreneurial capacity building but also contribute to the broader goals of inclusive growth and social cohesion.

Despite offering valuable insights, this study is not without limitations. Its focus on NUTS1-level regions may obscure important intra-regional dynamics, which future research could explore using more granular datasets. The use of annual data over a relatively short period also limits temporal depth. Expanding the analysis to include cultural, technological, and institutional variables would allow for a more holistic understanding of entrepreneurship. Comparative studies across similar middle-income countries would further enrich this line of research and help inform cross-national policy learning.

REFERENCES

Acemoglu, D., & Robinson, J. A. (2008). The role of institutions in economic development. *Journal of Economic Perspectives, 22*(2), 3–30. https://doi.org/10.1257/jep.22.2.3

Acs, Z. J., Audretsch, D. B., Braunerhjelm, P., & Carlsson, B. (2012). Growth and entrepreneurship. *Small Business Economics, 39*(2), 289–300. https://doi.org/10.1007/s11187-010-9307-2

Amaghouss, J., & Ibourk, A. (2013). Entrepreneurial activities, innovation and economic growth: The role of institutional environment in OECD countries. *Journal of Business Economics and Management, 14*(3), 623–639. https://doi.org/10.3846/16111699.2012.708612

Aparicio, S., Urbano, D., & Audretsch, D. B. (2016). Institutional factors, opportunity entrepreneurship, and economic growth. *Journal of Business Research, 69*(11), 4906–4912. https://doi.org/10.1016/j.jbusres.2016.04.011

Apaydın, Ş. (2018). Entrepreneurship, innovation and business cycles in Turkey. *Journal of Applied Economic Sciences, 13*(59), 1133 - 1142.

Arslan, M., & Tatlıdil, H. (2012). Türkiye'de girişimcilik ve kültürel dinamikler: Ampirik bir değerlendirme. *Kültür Ekonomisi ve Yönetimi Dergisi, 5*(3), 78–94.

Audretsch, D. B., & Thurik, R. (2004). A model of the entrepreneurial economy. *Journal of Economic Perspectives, 18*(2), 207–226. https://doi.org/10.1257/089533004773563485

Borah, A. J., & Bhowal, A. (2023). The Economics of Entrepreneurship: Drivers, Impacts, and Policy Implications. *South Asian Journal of Social Studies and Economics*, *20*(2), 89-99. https://doi.org/10.9734/SAJSSE/2023/v20i2703

Breitung, J. (2000). The local power of some unit root tests for panel data. In B. H. Baltagi (Ed.), *Advances in econometrics: Nonstationary panels, panel cointegration, and dynamic panels, 15*, 161–178, Amsterdam: JAI Press.

Carree, M. A., & Thurik, A. R. (2005). The impact of entrepreneurship on economic growth. In Z. J. Acs & D. B. Audretsch (Eds.), *Handbook of entrepreneurship research,* 437–471, Springer. https://doi.org/10.1007/0-387-24519-7_20

Demirtaş, C. (2020). Sosyal girişimcilik ile ekonomik büyüle ilişkisi: OECD ülkeleri ve Türkiye üzerine ampirik bir analiz. *Anadolu Üniversitesi Sosyal Bilimler Dergisi, 20*(3), 45–62.

Doran, J., McCarthy, N., & O'Connor, M. (2018). The role of entrepreneurship in stimulating economic growth in developed and developing countries. *World Development, 102*, 102–114. https://doi.org/10.1016/j.worlddev.2017.09.013

Emhan, A. (2011). The effects of terror and violence on entrepreneurs in the Eastern and South-Eastern regions of Turkey: A field research. *Sosyoekonomi*, *16*(16). https://doi.org/10.17233/se.13298

EuroStat (2024). Database, https://ec.europa.eu/eurostat/web/main/data/database, retrieved date: [08.12.2024].

Gu, W., Pan, H., Hu, Z., & Liu, Z. (2022). The triple bottom line of sustainable entrepreneurship and economic policy uncertainty: An empirical evidence from 22 countries. *International Journal of Environmental Research and Public Health*, *19*(13), 7758. https://doi.org/10.3390/ijerph19137758

Gülmez, A., & Yardımcıoğlu, F. (2012). OECD ülkelerinde Ar-Ge harcamaları ve ekonomik büyüme ilişkisi: Panel eşbütünleşme ve panel nedensellik analizi (1990-2010). *Maliye Dergisi, 163*(1), 335–353.

Gür, B. (2017). Girişimcilik endeksinin büyümeye etkisi: Gelişmiş ve gelişmekte olan ülkeler karşılaştırması. *Eurasian Econometrics, Statistics & Empirical Economics Journal, 7*(1), 99–113.

Hoselitz, B. F. (1952). Entrepreneurship and economic growth. *The American Journal of Economics and Sociology, 12*(1), 97–110.

Im, K. S., Pesaran, M. H., & Shin, Y. (2003). Testing for unit roots in heterogeneous panels. *Journal of Econometrics, 115*, 53–74. https://doi.org/10.1016/S0304-4076(03)00092-7

Kao, C. (1999). Spurious regression and residual-based tests for cointegration in panel data. *Journal of Econometrics, 90*, 1–44. https://doi.org/10.1016/S0304-4076(98)00023-2

Karagöz, K. (2022). Impact of entrepreneurship on employment: An econometric investigation for Turkey. *Sosyal Bilimler Akademi Dergisi*, *5*(2), 249-263. https://doi.org/10.38004/sobad.1186270

Kaya, Z., & Aydoğdu, M. (2021). Türkiye'de girişimcilik politikalarının ekonomik büyüme üzerindeki etkisi. *İktisat ve Toplum Dergisi, 6*(4), 35–50.

Kirzner, I. M. (1973). *Competition and Entrepreneurship*. University of Chicago Press.

Méndez-Picazo, M.-T., Galindo-Martín, M. A., & Castano-Martinez, M.S. (2021). Effects of sociocultural and economic factors on social entrepreneurship and sustainable development. *Journal of Innovation & Knowledge, 6*(1), 69–77. https://doi.org/10.1016/j.jik.2020.07.001

Neumann, T. (2021). The impact of entrepreneurship on economic, social and environmental welfare and its determinants: a systematic review. *Management Review Quarterly*, *71*(3), 553-584. https://doi.org/10.1007/s11301-020-00193-7

Pedroni, P. (1999). Critical values for cointegration tests in heterogeneous panels with multiple regressors. *Oxford Bulletin of Economics and Statistics, 61*, 653–670.

Pedroni, P. (2000). Fully-modified OLS for heterogeneous cointegrated panels. *Advances in Econometrics, 15*, 93–130.

Schumpeter, J. A. (1934). *The theory of economic development: An inquiry into profits, capital, credit, interest, and the business cycle*. Harvard University Press.

Sipahi D. E., & Artantaş, E. (2023). Exploring the link between social work, entrepreneurial leadership, social embeddedness, social entrepreneurship and firm performance: a case of SMES owned by Chinese ethnic community in Turkey. *Journal of Enterprising Communities: People and Places in the Global Economy*, *17*(3), 684-707. https://doi.org/10.1108/JEC-11-2021-0162

Stoica, O., Roman, A., & Rusu, V. D. (2020). The nexus between entrepreneurship and economic growth: A comparative analysis on groups of countries. *Sustainability, 12*(3), 1186. https://doi.org/10.3390/su12031186

Şahin, F., & Akça, M. (2019). Türkiye'de girişimcilik ekosistemi: Kurumsal faktörler ve sosyal sermaye. *Türk Girişimcilik ve Yenilik Dergisi, 6*(2), 88–104.

Tunali, C. B., & Sener, S. (2019). The determinants of entrepreneurship in Turkey. *Procedia Computer Science*, *158*, 648-652. https://doi.org/10.1016/j.procs.2019.09.099

Turgut, S. & Akgun, A. A. (2015). The causality between entrepreneurial activities and regional economic growth: Case of Turkey. 55th Congress of the European Regional Science Association: "World Renaissance: Changing roles for people and places", 25-28 August 2015, Lisbon, Portugal, European Regional Science Association (ERSA), Louvain-la-Neuve

TurkStat (2024), Data portal for statistics, https://data.tuik.gov.tr/, retrieved data: [07.12.2024].

Urbano, D., Aparicio, S., & Audretsch, D. (2019). Twenty-five years of research on institutions, entrepreneurship, and economic growth: What has been learned? *Small Business Economics, 53*(1), 21–49. https://doi.org/10.1007/s11187-018-0038-0

Van Rijn, M., Raab, J., Roosma, F., & Achterberg, P. (2024). To prove and improve: An empirical study on why social entrepreneurs measure their social impact. *Journal of Social Entrepreneurship*, *15*(2), 494-516. https://doi.org/10.1080/19420676.2021.1975797

Wennekers, S., & Thurik, R. (1999). Linking entrepreneurship and economic growth. *Small Business Economics, 13*(1), 27–55. https://doi.org/10.1023/A:1008063200484

Wong, P. K., Ho, Y. P., & Autio, E. (2005). Entrepreneurship, innovation and economic growth: Evidence from GEM data. *Small Business Economics, 24*(3), 335–350. https://doi.org/10.1007/s11187-005-2000-1

Author Contributions

All authors have contributed equally.