INTERNATIONAL JOURNAL OF BUSINESS STRATEGY AND INNOVATION
Int. J. Bus. Strategy Innov. (ISSN Online: 3139-9088)
Volume 01 | Issue 02 | 2026 | Page 106-132
OPEN ACCESS

EDUCATION, ECONOMIC GROWTH, AND DIGITAL INFRASTRUCTURE AS DRIVERS OF ENTREPRENEURSHIP: A PANEL DATA ANALYSIS

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How to cite this article:
Maham, S., Altaf, M. E. A., Aqib, M., Imtiaz, M., & Butt, S. (2026). Education, Economic Growth, and Digital Infrastructure as Drivers of Entrepreneurship: A Panel Data Analysis. International Journal of Business Strategy and Innovation, 1(2), 106-132.

Received: 10 July 2026 | Accepted: 24 August 2026 | Published: 27 August 2026

DOI: https://doi.org/10.68090/IJBSIVol1Iss2-20

Abstract

This paper analyzes the association between education, economic growth, digital infrastructure and entrepreneurship based on panel data of 150 countries for 2010-2024. In performing random-effects GLS regression with Driscoll–Kraay standard errors, education level ($\beta = 0.003$, $p < 0.001$) and economic growth ($\beta = 0.004$, $p < 0.001$) appear to be significant positive drivers of entrepreneurship (new business density). Digital infrastructure shows the highest association ($\beta = 0.070$, $p < 0.001$). By mediation analysis, the education–entrepreneurship relationship was significantly mediated by digital

infrastructure (indirect effect = 0.00049, Sobel z = 4.30, $p < 0.001$) accounting for approximately 13.5% of the total effect. Regarding the mediation of economic growth through digital infrastructure, it is also significant but inconsistent mediation (indirect effect = –0.00035, Sobel z = –2.27, $p < 0.05$), indicating that economic growth directly drives entrepreneurship, but its negative relationship with digital infrastructure partially reduces this positive relation. These results build on the RBV, as they show how digital infrastructure acts as a resource-conversion mechanism, converting human resources into entrepreneurial results. The findings underscore the need for a comprehensive approach to investments in education, digital infrastructure, and economic resilience to build entrepreneurial ecosystems.

Keywords

Entrepreneurship, Education, Economic Growth, Digital Infrastructure, Resource Based View, Panel Data, Mediation Analysis.

Introduction

Over the years, the role of entrepreneurship in the development of economies, innovations, employment, and the social development have become increasingly discussed (Sagar, 2024). Entrepreneurial activities have conventionally been linked to creation of economic values and business opportunities (Cullen & De Angelis, 2021). But with the increasing importance of environmental destruction, climate change, resources limitations, and social challenges, the definition of entrepreneurship has broadened from traditional economic goals (Gibbs, 2006). Entrepreneurship is seen today as a powerful instrument for development and is crucial to the attainment of the Sustainable Development Goals (SDGs) which call for concerted actions by governments, businesses, entrepreneurs and communities (Sachs et al., 2019). Therefore, it is necessary to acquire more knowledge of what makes entrepreneurship easier and to develop entrepreneurial ecosystems that can contribute to more economic growth and development. Education and economic growth are two important factors that can impact entrepreneurship (Cervelló-Royo et al., 2020).

Education equips people with knowledge, skills, critical thinking and awareness to recognize and embrace entrepreneurial opportunities (Ghafar, 2020). Moreover, education increases awareness of environmental and societal problems, encouraging entrepreneurs to take environmental and social issues into account (Suguna et al., 2024). So, education is a catalyst for entrepreneurial activities which can create economic value and solve environmental and social problems. From the macroeconomic perspective, the expansion of market opportunities, investment, income, financial resources, and demand for innovation in products and services offer support for entrepreneurship (Galindo-Martín et al., 2020). An expanding economy provides more opportunities for entrepreneurial business ventures to launch and thrive. But the connection between economic growth and entrepreneurship may also be contingent on the availability of suitable technological and institutional environments.

In this sense, the importance of digital infrastructure is even more remarkable. Digital infrastructure, defined as digital technologies, digital platforms, communication networks and internet access, allows entrepreneurs to efficiently access knowledge, information, markets, financial services and customers (Elia et al., 2020; Steininger, 2018). It helps to convert education and economic opportunities into viable entrepreneurial ventures by reducing transaction costs, increasing connectivity and promoting innovation.

Previous cross-country studies have found that education (Ahmed et al., 2010; Altwaijri et al., 2024) and economic growth (Rashid et al., 2025; Urbano et al., 2020) have a significant independent effect on entrepreneurship. In practice, however, the processes through which these macro-level factors are manifested as entrepreneurial activity have been little explored in theory. Specifically, digital infrastructure (enabling entrepreneurs to access markets, information and financial services) has not been studied empirically in the context of a single framework. Although digital infrastructure is known to be a direct predictor of entrepreneurship (Elia et al., 2020; Steininger, 2018), its function as a transmission mechanism from human capital and economic conditions to entrepreneurial outcomes is not clearly understood. This study aims to fill this gap by proposing and testing a mediation model in which digital infrastructure acts as a resource-conversion mechanism connecting two factors affecting the entrepreneurial activity: investments in education and macroeconomic conditions.

This study has three major goals to fill this void. First, it looks at direct links between level of education, growth and entrepreneurship. Secondly, it looks at how digital infrastructure acts as a mediator in these connections. Third, it builds on the country level application of the RBV by viewing education, economic growth and digital infrastructure as complementary resources that allow entrepreneurship to take place. In particular, we ask: (1) Is there a significant positive relationship between education and economic growth, and entrepreneurship? (2) Do the relationships between these elements get in-betweened by digital infrastructure? After accounting for country-specific heterogeneity, (3) How strong are these associations?

In this study, the term "entrepreneurship" is used throughout to indicate formal entrepreneurial activities (new business registration). We recognize the relevance of sustainability, but our empirical measure is general entrepreneurship and not sustainability specific outcomes. While education is usually viewed as a factor of human capital at the individual level, our education measure is the tertiary enrolment rate, which reflects the stock of human capital at the national level. Likewise, economic growth and digital infrastructure are constructs on the country level. Therefore, our analysis of entrepreneurial ecosystems is conducted from the perspective of the combined effect of country-level resources (human capital stock, macroeconomic conditions and technological infrastructure).

This research goes beyond the RBV's usual focus on firm-level resources and conceptualises country-level resources and capabilities. Education is a stock of human capital resources at national level, economic growth is macro-economic resources and opportunities at national level, and digital infrastructure is technological resources that facilitates access to markets, information and financial services at national level. Based on RBV, we suggest that entrepreneurial abilities could be built in countries by effectively managing these three types of complementary resources. Traditionally, RBV has centered on the way in which companies can achieve competitive advantages by having valuable, scarce and inimitable resources (Barney, 1991); here we extend this logic to the ecosystem level, whereby countries with more human capital, a more robust economic base and a better technological ecosystem are more able to foster entrepreneurial activity. Digital infrastructure, like organizational capabilities in RBV, is a conversion mechanism that converts human and economic resources into entrepreneurial outcomes.

The significance of this research is that it examines the links among education, economic growth, digital infrastructure, and entrepreneurship in a novel and unifying framework. It examines first the direct links between education and entrepreneurship and second, the direct links between economic growth and entrepreneurship. It also offers information on the complementarities between education and economic

development in the process of entrepreneurial development. Moreover, digital infrastructure is analysed as a mediating variable to try to find the existence of mediation between education conditions and economic conditions in the process of entrepreneurial development. The findings offer implications for stakeholders such as entrepreneurs, educational institutions and policy makers to make entrepreneurial ecosystems better. Education's role provides information to encourage entrepreneurial knowledge and awareness, and economic growth and digital infrastructure provide information to help decision making that can create an environment for business development.

Literature Review

Resource Based View Theory

Based View (RBV) offers an important theoretical lens to analyse how valuable resources and capabilities (Kero & Bogale, 2023; Farooqui & Mehmood, 2026) can be acquired and used effectively in order to improve the performance of an organization. RBV was first theorized by Penrose (1959) and developed by Barney (1991) suggests that organisational differences in resources account for differences in organisational performance and competitive outcomes (El Shafeey & Trott, 2014). According to Coates and McDermott (2002), resources in RBV are defined as physical, human, knowledge, skills, technological or organizational assets. Barney & Clark, 2007: Valuable, Rare, Difficult to Imitate, and Organizationally Supported resources are essential for a competitive advantage. Therefore, RBV puts great focus on the availability and effective management of resources as the precondition for the development of an organization's capability to adapt to its environment and reach the desired outcome.

This study builds on RBV and expands the concept to the country level through the conceptualization of national resources and capabilities. Education is a stock of human capital resources at the national level. The level of economic growth mirrors macroeconomic resources and opportunities. Digital infrastructure refers to the technology resources necessary to gain access to markets, information and financial services. Based on RBV, we propose that country's entrepreneurial capabilities can be nurtured through proper utilization of these three complementary resources. RBV typically emphasizes the benefit and scarcity of the resources that allow companies to achieve competitive advantage (Barney, 1991), but we extend the logic to the ecosystem level: a country that contains more human capital, more economic resources, and more technological resources will be better equipped to develop entrepreneurial activity. Digital infrastructure is a conversion mechanism, like organizational capabilities in RBV, and it converts human and economic resources into entrepreneurial results.

The RBV is expected to be appropriate for this study because entrepreneurship involves the recognition and exploitation of opportunities for the generation of economic, environmental and social value using a mix of resources and capabilities (Tate & Bals, 2018). Education can equip entrepreneurs with knowledge, skills, awareness and problem-solving skills which aid in entrepreneurial activities (Biberhofer et al., 2018). Likewise, economic growth can offer resources, markets, investment opportunities, and other economic conditions, which can ease entrepreneurial development. Digital infrastructure improves access to information, to the digital marketplace, to communication channels, and to innovative solutions (Greenstein, 2019). Through RBV, a clear picture emerges of the role that various resources and conditions play in enabling (or impeding) entrepreneurship.

Education Level (EL) is a significant human resource that facilitates entrepreneurial knowledge and skills (Altwaijri et al., 2024) and Economic Growth (EG) is the sum of economic resources and opportunities that are available to entrepreneurs (Prieger et al., 2016). It is a mediator between these resources and opportunities and the entrepreneurial outcomes, Digital Infrastructure (DI). The model suggests that there are direct linkages between education and economic growth, and their impacts on Entrepreneurship (E) and there are also indirect impacts via Digital Infrastructure. RBV therefore offers a logical and unified theoretical perspective on the role that the facilitation of human, economic and technological resources can play in supporting entrepreneurial behavior.

Hypothesis Development

Education Level and Entrepreneurship (H1): Education is an important medium to build knowledge, skills, awareness and capabilities that can play a role in influencing entrepreneurs' decision making and entrepreneurial opportunities identification (Ahmed et al., 2010). The RBV approach suggests that human knowledge and skills are valuable resources which can be utilized to create capabilities and create the desired outcomes for individuals and organizations. Well-educated people have better skills in acquiring information and processing it, in identifying opportunities, in problem-solving and in innovative business activities (Muzam, 2022). These skills are especially applicable in the context of entrepreneurship, as the entrepreneurs have to consider economic, environmental and social aspects. Education also raises awareness among people about the environment, sustainable development, resource efficiency and socially responsible business. (Hariram et al., 2023). Possibly, more educated entrepreneurs will recognise opportunities associated with products, services, technologies and business models that can solve these concerns. Moreover, education enhances entrepreneurial skills and supports innovative thinking to find solutions to social and environmental issues (Gomez, 2024). Therefore, education should not only be about the traditional skill set of entrepreneurship but also knowledge and awareness about sustainability in entrepreneurship. On the basis of this, we hypothesize:

H1: *Education Level (EL) has a significant positive association with Entrepreneurship (E).*

Economic Growth and Entrepreneurship (H2): Entrepreneurship development can be positively impacted by economic growth through higher income, higher market opportunities, more investments in entrepreneurship, availability of financing, and enhanced economic stability (Rashid et al., 2025). From the RBV perspective, economic resources and opportunities help individuals and organizations create and leverage resources necessary for entrepreneurial engagement (Agrawal et al., 2024). As the economy expands, consumers have more purchasing power and new products and services are created, which can be used by entrepreneurs to take advantage of new market opportunities (Cavusgil et al., 2021). Economic expansion, in turn, facilitates innovation, technology, infrastructure, and business development investments that improve entrepreneurial capabilities to develop products, services, and business models (Kwilinski et al., 2024). Moreover, economically developed areas offer more opportunities for businesses to profit from an increasing demand for products that are environmentally and socially responsible. With the improving economy, entrepreneurs are able to access the resources to embed sustainability in their operations (Kaftan et al., 2023). Market and financial opportunities are therefore provided through economic growth for entrepreneurs to pursue economic value creation while mitigating environmental and social problems. For this reason, we hypothesize that:

H2: *Economic Growth (EG) has a significant positive association with Entrepreneurship (E).*

The Mediating Role of Digital Infrastructure (H3a and H3b): The role of digital infrastructure as a mediator for 2.2.3 is given in the following paragraphs. The combination of human capital and good economic conditions is more effective in supporting entrepreneurial development than when used alone (Prasetyo & Kistanti, 2020). Education gives knowledge, skills, and awareness of social and environmental issues (Miao & Nduneseokwu, 2024) and the economic growth provides a conducive environment for entrepreneurship (Urbano et al., 2020). The Resource Based View (Kero & Bogale, 2023) suggests that managing and leveraging multiple assets allows organizations to attain their objectives. However, the translation of these resources to entrepreneurial outcomes is not easy to come by. Digital infrastructure is an important intermediary to draw on human capital and economic resources effectively to use. Digital infrastructure (such as Internet, digital platforms, and communication networks) can have a positive impact on access to information, to markets, to financial services, lower transaction costs, and foster innovation (Elia et al., 2020; Steininger, 2018).

Mediation model asserts that education and economic development affect digital infrastructure. Higher education levels have the potential to drive demand for digital technologies in theory, as higher levels of digital literacy, awareness of digital opportunities, and capabilities of the workforce are associated with increased demand for digital technologies (Miao & Nduneseokwu, 2024). People with higher education levels tend to be more prepared to learn digital skills, use services that use the internet and to contribute to digital platforms (Greenstein, 2019). Likewise, economic growth generates financial means for financing digital infrastructure investments, drives demand for digital services and allows the government and private sector to invest in connectivity (Kwilinski et al., 2024). The development of strong digital infrastructure along with education and economic development provides greater opportunities for entrepreneurial activity. Education—the vehicle for knowledge and resource sharing can pave the way for economic opportunities through digital infrastructure, and catalyze entrepreneurial outcomes (Al-Mamary, 2025; Al-Mamary & Singh, 2025). For this reason, digital infrastructure bridges the education and economic development, and the education and entrepreneurship relations. For this reason, we hypothesize that:

> ***H3a:*** *Digital Infrastructure (DI) mediates the relationship between Education Level (EL) and Entrepreneurship (E), such that the indirect effect of EL on E through DI is significant.*

> ***H3b:*** *Digital Infrastructure (DI) mediates the relationship between Economic Growth (EG) and Entrepreneurship (E), such that the indirect effect of EG on E through DI is significant.*

Conceptual Framework

Figure 1 presents the conceptual framework illustrating the hypothesized relationships. The framework depicts direct effects (H1 and H2) from Education Level and Economic Growth to Entrepreneurship, as well as indirect effects (H3a and H3b) through Digital Infrastructure as a mediating variable.

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OPEN ACCESS

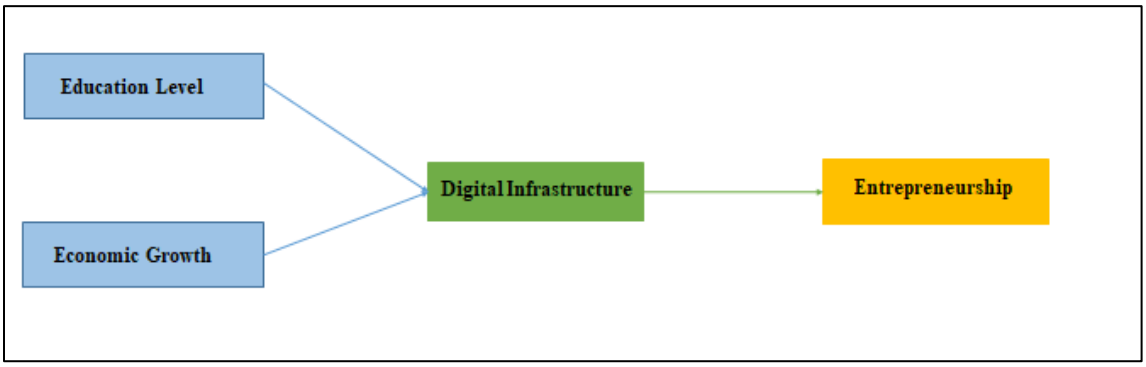

Figure 1: Conceptual Framework Illustrating the Hypothesized Relationships

Research Methodology

Research Philosophy and Approach

The approach of this study is positivist research. According to the positivist approach in research, social phenomena can be objectively studied from observable and measurable facts (Saunders et al., 2023). The positivist paradigm is suitable for this research because it seeks to discover a relationship between the variables in question and the hypotheses are tested empirically using theories that have been established, such as the Human Capital Theory (Schultz, 1961), Endogenous Growth Theory (Romer, 1990) and Technology/org. Environment (TOE) (Tornatzky & Fleischer, 1990). It uses a deductive research methodology, which begins with an abstractional statement (theory) and then moves towards the empirical observation (Saunders et al., 2023). This is in line with how the most prominent entrepreneurship journals are generally structured, being deductive and hypothesis testing (Maula & Stam, 2019; Wiklund et al., 2011).

Research Design

The data set for this study is quantitative, longitudinal and panel data of 150 countries for the period 2010-2024 with 2,250 observations. The 15-year period corresponds to the post global financial crisis, ten years of digital transformation and the era of entrepreneurship as a separate academic discipline (Benavides-Sánchez et al., 2024; Audretsch & Belitski, 2017). The panel data structure has a number of unique features that can help overcome methodological issues that arise in entrepreneurship research (Wooldridge, 2010; Baltagi, 2021). The panel structure offers more degrees of freedom and statistical power, gives control over unobserved heterogeneity (either through fixed or random effects modeling) and less omitted variable bias (Hsiao, 2014). Further, the panel structure allows for a more dynamic representation of the relationships and temporal effects that can be understood, giving a more powerful analysis than cross-sectional designs (Wooldridge, 2010). We note, however, that our results do not imply causation, but only association, using panel data.

Data Sources and Sample

Secondary data were obtained from the World Bank's World Development Indicators (WDI), which is a well-known, publicly available and international database to ensure transparency and replicability (Nature Methods, 2025). The WDI offers a full suite of macroeconomic indicators such as GDP growth

rates, education enrollment rates, digital infrastructure indicators and new business density. The data for all variables used in this study were obtained from WDI. Extracted: January 2025. Indicator codes used are: NY.GDP.PCAP.KD.ZG (GDP per capita growth), SE.TER.ENRR (Tertiary enrollment), IT.NET.USER.ZS (Internet users), IT.BBD.US (Broadband subscriptions), IT.CEL.SETS (Mobile subscriptions), and IC.REG.NEW (New business density).

The sample includes the countries of the world for the years 2010-2024. Selection of criteria was guided by availability of data for all variables of interest for the entire timeframe of the study. We built a balanced panel by including only countries which had all variables for all 15 years. The missing years were not included in the countries to ensure the balance of the structure. No imputation was done. As in other entrepreneurship studies that use multi country panel data analysis (Audretsch & Belitski, 2017; Benavides-Sánchez et al., 2024), the final sample includes 150 countries × 15 years = 2,250 observations.

Variable Measurement and Operationalization

Table 1 presents the comprehensive operationalization of all variables used in this study, including definitions, measurement indicators, data sources, and anticipated relationships.

Table 1: Variable Description

Variable	Symbol	Type	Measurement	Indicator	Source
Entrepreneurship	E	DV	Log (x+1) of new business density	New business registrations per 1,000 people ages 15-64	WDI
Economic Growth	EG	IV	Annual GDP per capita growth (%)	GDP per capita growth (annual %) at market prices based on constant local currency	WDI
Education Level	EL	IV	Gross tertiary education enrollment (%)	School enrollment, tertiary (% gross) regardless of age	WDI
Digital Infrastructure	DI	Mediator	Standardized composite index via Principal Component Analysis	1. Internet users (% of population) 2. Broadband subscriptions (per 100) 3. Mobile subscriptions (per 100)	WDI

Entrepreneurship (E) is measured as the natural logarithm of (new business density + 1), that is, log(x+1) where x = number of new corporations per 1,000 working age population (15 64) (World Bank, 2024). The rate of formal entrepreneurial activity is used extensively as an indicator of entrepreneurial dynamism in cross-country studies, being widely used in research and practice (Acs et al., 2018; Klapper et al., 2016). The log transformation corrects for the skewness in the distribution of entrepreneurial activity and facilitates interpretation of the coefficients as percentage changes (Wooldridge, 2010). The +1 transformation is used to ensure that zero values (countries with no new registrations) will be included in the analysis because the natural logarithm of zero is undefined.

Economic Growth (EG): GDP per capita at market prices (2017 constant local currency) as a percentage change in 1 year (World Bank, 2024). This indicator reflects macroeconomic conditions that may affect

entrepreneurial activity and has been extensively used in cross country entrepreneurship studies (Audretsch & Belitski, 2017; Audretsch et al., 2021).

Education Level (EL) is calculated by the ratio of gross tertiary education enrollment (GTEE) (percentage of the population enrolled in tertiary education programs, all ages) (World Bank, 2024). It is an operationalisation of advanced human capital stock in the economy, and consistent with the role of the Human Capital Theory which suggests that the performance of entrepreneurs is affected by the human capital stock of the economy (Schultz, 1961; Becker, 1964). Tertiary education is a structural indicator and cannot necessarily reflect the quality of education and/or entrepreneurial capabilities but is the best available indicator of human capital at the national level in comparative country analysis.

Digital Infrastructure (DI) is realized as a composite index (standardized) based on the indicators of digital connectivity and development of digital infrastructure. The composite indicator was developed by Principal Component Analysis (PCA) of three indicators of the WDI: internet users as percentage of population, broadband subscriptions per 100 people and mobile cellular subscriptions per 100 people. Pooled samples were analysed by PCA for all years. The first principal component was kept as it accounted for 68.4% of the variance with an eigenvalue of 2.052. The loadings of these components were: internet users (0.632), internet broadband subscriptions (0.581) and mobile subscriptions (0.514). An index of this sort was standardized to give a mean score of 0 and a standard deviation of 1. In this way, the commonalities of these indicators can be captured, and a parsimonious measure of digital infrastructure can be developed (Benavides-Sánchez, 2024; Audretsch & Belitski, 2017).

Model Specification

To test the direct effects of Education Level (EL) and Economic Growth (EG) on Entrepreneurship (E), we estimate the following baseline model:

Equation 1:

$$Eit = \alpha + \beta 1ELit + \beta 2EGit + \gamma i + \delta t + \varepsilon it$$

To test the mediating role of Digital Infrastructure (DI), we follow the Baron & Kenny (1986) approach and estimate a system of three equations:

Equation 2 (Path a: IV → Mediator):

$$DIit = \alpha + \beta 1ELit + \beta 2EGit + \gamma i + \delta t + \varepsilon it$$

Equation 3 (Path b: Mediator → DV, controlling for IVs):

$$Eit = \alpha + \beta 1ELit + \beta 2EGit + \beta 3DIit + \gamma i + \delta t + \varepsilon it$$

Where:

- E = Entrepreneurship in country i at time t
- EL = Education Level
- EG = Economic Growth
- DI = Digital Infrastructure
- γi = Country fixed effects (unobserved time invariant heterogeneity)

- δt = Time fixed effects (common time shocks)
- εit = Idiosyncratic error term

The indirect effects are calculated as:

- Indirect Effect (EL → DI → E) = β 1(Equation 2) × β 3(Equation 3)
- Indirect Effect (EG → DI → E) = β 2(Equation 2) × β 3(Equation 3)

The overall effect is the sum of the direct effect and indirect effect. The Sobel test (Sobel, 1982; Hayes, 2017) is used to assess the significance of the indirect effects. To calculate the proportion mediated the indirect effect is divided by the total effect.

We use random effects (RE) estimation with the mediation analysis. The direct effects model is favoured by the Hausman test; however, the mediation paths are mostly cross country in nature and not within country over time. The RE model accounts for more of the between-country variation, which is key to the mediation mechanism, and explains 2.3% of the within-country variation. The method followed here is similar to previous cross-country mediation research (Benavides Sánchez et al., 2024; Acs et al., 2018).

Estimation Techniques and Diagnostic Tests

To choose the appropriate estimator, a Hausman specification test was used, which can be used to determine the estimator that should be applied (Hausman, 1978). This is because the fixed effects model removes omitted variable bias by estimating a separate intercept for each cross-sectional unit (Wooldridge, 2010). In the random effects model, the country effect is considered as random and independent of the regressors.

The Variance Inflation Factor (VIF) was used to detect multicollinearity of independent variables (Belsley et al., 1980). The rule of thumb is that if VIF > 10 the model has problematic multicollinearity (O'Brien, 2007).

To check for the possibility of common shocks or spatial spillovers that may give rise to sectional dependence of the panel data, the Pesaran Cross sectional Dependence (CD) test was conducted (Pesaran 2004). If the null hypothesis of cross-sectional independence is rejected then robust standard errors should be employed (Driscoll & Kraay, 1998). Spatial and temporal dependence were accounted for by using Driscoll & Kraay (1998) standard errors, which are valid for general forms of spatial and temporal dependence (Driscoll & Kraay, 1998; Hoechle, 2007).

Panel unit root tests (Im Pesaran Shin and Fisher type tests) were conducted to check for stationarity of the variables. Because the period of tertiary education and digital infrastructure are trending in nature, we first tested for panel unit roots to account for a potential for spurious regression.

Model fit was evaluated by R squared (within, between and overall), F statistics and information criteria such as Akaike Information Criterion (AIC) (Akaike, 1974) and Bayesian Information Criterion (BIC) (Schwarz, 1978).

We recognize that observational data has its limits and establish no cause and effect. Our findings are associations that could be due to omitted variable bias, reverse causality, and endogeneity. We deal with these issues by introducing country and time fixed-effects, robust standard errors and diagnostic tests.

Additional strategies like instrumental variables and quasi-experimental designs are, however, needed to identify causes.

Results

Descriptive Statistics

Descriptive statistics for all the variables used in the analysis are presented in Table 2. There is a wide range of entrepreneurial activity in the 150 countries during 2010-2024 as seen by Entrepreneurship (E) which ranges from 0.007 to 5.788 with an SD of 0.958. There is also a large standard deviation in EL (32.463) with a mean of (43.292), suggesting significant variation in tertiary education enrolment rates between countries. In terms of economic growth, it is 1.870 on average, with a standard deviation of 5.979 and a range of –55.294 to 91.781, indicating that economic growth rates have been volatile both between countries and over time. The mean of Digital Infrastructure (DI) is 0.000, and the standard deviation is 1.000 with the range from –2.371 to 10.781. The results of the analysis of all the indicators are in line with the previous cross-country study on entrepreneurship (Benavides-Sánchez et al., 2024; Acs et al., 2018); the sample is shown to be heterogeneous for this study and suitable for regression analysis.

Table 2: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
LNE	2250	1.197	0.958	0.007	5.788
EL	2250	43.292	32.463	0.81	166.39
EG	2250	1.87	5.979	-55.294	91.781
DI	2250	0.000	1.00	-2.371	10.781

Correlation Analysis

The Pearson correlation matrix is shown in Table 3. The results show that there is a positive significant correlation between Education Level (EL) and Entrepreneurship (E) ($r = 0.440$, $p < 0.01$). There is also a positive and significant relationship between Digital Infrastructure (DI) and E ($r = 0.412$, $p < 0.01$). Economic Growth (EG) is positively, and weakly correlated with E ($r = 0.039$, $p < 0.05$). Important to note, however, is the positive correlation between DI and EL ($r = 0.374$, $p < 0.01$) showing countries with more digital infrastructure have higher education levels. The correlations of EG with EL and DI are not significant. Preliminary support of hypothesized relationships is provided in these correlations

Table 3: Matrix of Correlations

Variables	LNE	EL	EG	DI
LNE	1.000			
EL	0.440	1.000		
EG	0.039	-0.003	1.000	
DI	0.412	0.374	-0.010	1.000

Multicollinearity Assessment

To see whether multicollinearity occurred among the independent variables, the Variance Inflation Factor (VIF) test was performed. The mean value of VIF is 1.109, as presented in Table 4, all the VIF values are below the traditional criterion of 10. In particular, VIF values of DI and EL are 1.163, and EG is 1.000. The

results show that there is no problem of multicollinearity in this study, which means that the independent variables are sufficiently different from each other and provide a reliable estimate of coefficients (O'Brien, 2007).

Table 4: Variance Inflation Factor		
	VIF	**1/VIF**
DI	1.163	0.86
EL	1.163	0.86
EG	1.00	1.00
Mean VIF	1.109	

Random Effects Regression Results

The random effects regression results for direct effects of Education Level, Economic Growth, and Digital Infrastructure on Entrepreneurship are reported in Table 5. The model is statistically significant (Wald $\chi^2 = 75.75$, $p < 0.001$), with an overall R^2 of 0.263.

Entrepreneurship has a statistically significant positive association with Education Level ($\beta = 0.003$, $p < 0.001$), indicating that a one percentage point increase in education level is associated with a 0.003 increase in entrepreneurship. Economic Growth has been found to positively and significantly correlate ($\beta = 0.004$, $p < 0.001$) with entrepreneurial activity, suggesting that the more the GDP per capita growth rate increases, the more entrepreneurial activity increases. Digital Infrastructure has the strongest association among the predictors ($\beta = 0.070$, $p < 0.001$), meaning that a one standard deviation increase in digital infrastructure is associated with a 0.070 increase in entrepreneurship.

Table 5: Random Effects Regression Results (Direct Effects)							
LNE	**Coef.**	**St. Err.**	**t-value**	**p-value**	**95% Conf**	**Interval**	**Sig**
EL	0.003	0.001	5.24	0.000	0.002	0.004	***
EG	0.004	0.001	3.55	0.000	0.002	0.006	***
DI	0.07	0.013	5.29	0.000	0.044	0.096	***
Constant	1.051	0.068	15.34	0.000	0.916	1.185	***
Mean dependent var		1.197		SD dependent var			0.958
Overall r-squared		0.263		Number of obs			2250
Chi-square		75.749		Prob > chi²			0.000
R-squared within		0.023		R-squared between			0.309
*** p<.01, ** p<.05, * p<.1							

Mediation Analysis Results

The indirect effects were estimated using Baron & Kenny (1986) method to test the mediation effect of Digital Infrastructure (H3a and H3b). Because the fixed effects model accounts for only 2.3% of the variance within countries, we used random effects (RE) estimation in the mediation analysis, which is important to reflect differences across countries and important to the mediation mechanism. The results of the complete mediation analysis are shown in Table 6.

Education Level is highly positively associated with Digital Infrastructure ($\beta = 0.007$, $p < 0.001$) and Economic Growth is highly negatively associated with Digital Infrastructure ($\beta = -0.005$, $p < 0.05$), as shown in Panel A. The first stage mediation paths are thus significant for both variables.

When holding other variables constant (Education Level and Economic Growth), the relationship between Digital Infrastructure and Entrepreneurship is confirmed by Panel B with β = 0.070, at p< 0.001.

As shown in Panel C, Education Level (β = 0.003, p < 0.001) and Economic Growth (β = 0.004, p < 0.001) remain significant direct effect on Entrepreneurship.

The indirect effect of Education Level on Entrepreneurship via Digital Infrastructure is significant (indirect effect = 0.00049, Sobel z = 4.30, p < 0.001), which is in support of H3a (partial mediation). Also, the indirect effect of Economic Growth through Digital Infrastructure has also been significant (indirect effect = –0.00035, Sobel z = –2.27, p < 0.05), but in this case it is an inconsistent mediation (also called competitive mediation) because the direct and indirect effects have opposite signs (H3b was supported).

As seen in the Panel E, the overall effect of Education Level (β = 0.004, p < 0.001) and Economic Growth (β = 0.004, p < 0.001) on Entrepreneurship is significant.

Panel F reveals that about 13.5% of the overall effect of Education Level on Entrepreneurship is transmitted as a result of Digital Infrastructure, but that Economic Growth (–8.75%) is suppressed by the mediation of Digital Infrastructure.

Table 6: Mediation Analysis Results

Path	Coef.	SE	z	p	95% CI
Path a (IV → Mediator)					
EL → DI	0.007	0.001	7.34	0	[0.005, 0.009]
EG → DI	–0.005	0.002	–2.50	0.012	[–0.008, –0.001]
Path b (Mediator → DV)					
DI → E	0.07	0.013	5.29	0	[0.044, 0.096]
Direct Effects					
EL → E	0.003	0.001	5.24	0	[0.002, 0.004]
EG → E	0.004	0.001	3.55	0	[0.002, 0.006]
Indirect Effects (a × b)					
EL → DI → E	0.00049	0.00011	4.3	0	[0.00027, 0.00071]
EG → DI → E	–0.00035	0.00014	–2.27	0.023	[–0.00063, –0.00007]
Total Effects					
EL → E	0.004	0.001	5.82	0	[0.002, 0.005]
EG → E	0.004	0.001	3.27	0.001	[0.001, 0.006]

Fixed Effects Regression Results

Fixed effects models were estimated to account for unobserved country specific heterogeneity. Table 7 shows the results of the fixed effects regression. The model is statistically significant (F = 16.35, p<0.001) but explains only 2.3% of the variance in the within country responses (R^2 within = 0.023). Education Level is positively and significantly associated with the variables (β = 0.002, p < 0.001); Economic Growth is positively and significantly associated with the variables (β = 0.004, p < 0.001); and Digital Infrastructure is positively and significantly associated with the variables (β = 0.059, p < 0.001). The low R^2 values within the rows show that the account for only a small proportion of the variation in entrepreneurship over time compared to the differences between cross section autonomous regions.

Table 7: Fixed Effects Regression Results							
LNE	**Coef.**	**St. Err.**	**t-value**	**p-value**	**95% Conf**	**Interval**	**Sig**
EL	0.002	0.001	3.63	0.000	0.001	0.004	***
EG	0.004	0.001	3.55	0.000	0.002	0.006	***
DI	0.059	0.013	4.45	0.000	0.033	0.085	***
Constant	1.09	0.028	38.69	0.000	1.035	1.145	***
Mean dependent var		1.197		SD dependent var			0.958
R-squared		0.023		Number of obs			2250
F-test		16.353		Prob > F			0.000
Akaike crit. (AIC)		667.196		Bayesian crit. (BIC)			690.071
*** p<.01, ** p<.05, * p<.1							

Diagnostic Tests

Hausman Specification Test: The Hausman specification test was performed to test the choice of fixed effects or random effects. The Hausman test results show a chi squared of 56.38 and a p value of 0.000 in Table 8. The null hypothesis is rejected, the random effects estimator is inconsistent for the direct effects model (Hausman, 1978, Wooldridge, 2010), so the fixed effects estimator is the preferred choice for direct effects. For the mediation analysis, however, random effects are used because most of the mediation paths are influenced by cross country variations.

Table 8: Hausman Specification Test			
Test	**χ^2**	**df**	**p-value**
Hausman	56.38	3.00	0.000

Cross Sectional Dependence Test: The Pesaran Cross Sectional Dependence (CD) test was used to identify cross sectional dependence in the panel data. All variables have a statistically significant CD test statistic at the 1% level (see Table 9) which suggests a high level of cross-sectional dependence. The range of CD test values is between E (44.624) and EG (133.922), with all p values < 0.001. The results suggest that the null hypothesis of cross-sectional independence is rejected and that robust standard errors (Driscoll Kraay) should be used (Pesaran, 2004; Driscoll & Kraay, 1998).

Table 9: Cross Sectional Dependence Test Results					
Variable	**CD-test**	**p-value**	**Average joint T**	**Mean ρ**	**Mean abs (ρ)**
LNE	44.624	0.000	15.00	0.11	0.34
EL	45.476	0.000	15.00	0.11	0.39
EG	133.922	0.000	15.00	0.33	0.38
DI	60.687	0.000	15.00	0.15	0.49

Robustness Checks

Driscoll Kraay Standard Errors: The cross-sectional dependence observed in the previous section was taken into account for the fixed effects model by estimating standard errors that are robust to general forms of spatial and temporal dependence, as introduced by Driscoll & Kraay (1998) and Hoechle (2007). The results are presented in Table 10. The model remains highly significant ($F = 27.30$, $p < 0.001$) with a within R^2 of 0.023. Education Level is positively and significantly associated with the variable ($\beta = 0.002$, $p<0.01$); the Economic Growth is positively and significantly associated with the variable ($\beta = 0.004$, $p<0.01$); the Digital Infrastructure is positively and significantly associated with the variable ($\beta = 0.059$,

p<0.001). Results are fairly stable with respect to cross sectional dependence as the significance of the coefficients is not substantially affected.

Table 10: Fixed Effects Regression with Driscoll Kraay Standard Errors						
LNE	**Coef.**	**Std. Err.**	**t**	**P>t**	**95% Conf.**	**Interval**
EL	0.002	0.001	3.090	0.008	0.001	0.004
EG	0.004	0.001	2.950	0.010	0.001	0.007
DI	0.059	0.009	6.890	0.000	0.041	0.078
_cons	1.090	0.021	51.070	0.000	1.044	1.136
*** p<.01, ** p<.05, * p<.1						

Alternative Model Specifications: A number of alternative specifications of the model were estimated to give added confidence in the results. In Table 11, the analysis of four robustness regressions with various combinations of the independent variables are provided. For all specifications, the relationship between Education Level is positive and statistically significant (all $p < 0.001$) with coefficients ranging from 0.003 to 0.014. Digital Infrastructure results are always positive and significant, ranging from 0.070 to 0.358 with all p values < 0.001. Economic Growth is important in some specifications, but not in others. All of the effects of Education Level and Digital Infrastructure are generally consistent, which indicates that these effects are strong (Maula & Stam, 2019). But it is important to recognize that Economic Growth has less impact and is less consistent.

Table 11: Robustness Regression Results				
Variable	**Specification 1**	**Specification 2**	**Specification 3**	**Specification 4**
EL	0.007*** (0.001)	0.012*** (0.001)	0.014*** (0.001)	0.013*** (0.002)
	[0.005, 0.008]	[0.011, 0.014]	[0.013, 0.016]	[0.009, 0.016]
EG	0.011*** (0.003)	0.010*** (0.003)	0.006 (0.004)	0.009 (0.008)
	[0.005, 0.017]	[0.003, 0.016]	[-0.002, 0.013]	[-0.007, 0.026]
DI	0.196*** (0.019)	0.289*** (0.022)	0.358*** (0.026)	0.282*** (0.053)
	[0.159, 0.234]	[0.247, 0.332]	[0.308, 0.409]	[0.177, 0.386]
Constant	0.271*** (0.032)	0.500*** (0.036)	0.981*** (0.043)	1.753*** (0.088)
	[0.209, 0.332]	[0.430, 0.570]	[0.898, 1.065]	[1.580, 1.925]
R^2	0.266	0.266	0.266	0.266
F-statistic	271.803***	271.803***	271.803***	271.803***
Observations	2,250	2,250	2,250	2,250
*** p < 0.01, ** p < 0.05, * p < 0.1.				

Summary of Hypothesis Testing

The results of the hypothesis testing are summarized on Table 12. The empirical results substantiate all the hypotheses. H1 (Education Level → Entrepreneurship) is accepted ($\beta = 0.003$, $p < 0.001$). H2 (Economic Growth → Entrepreneurship) is accepted ($\beta = 0.004$, $p < 0.001$). H3a (EL → DI → E) is accepted (indirect effect = 0.00049, Sobel z = 4.30, $p < 0.001$). H3b (EG → DI → E) is accepted (indirect effect = ‑0.00035, Sobel z = ‑2.27, $p < 0.05$), though it represents inconsistent mediation.

Table 12: Summary of Hypothesis Testing		
Hypothesis	**Statement**	**Status**
H1	Education Level (EL) has a significant positive association with Entrepreneurship (E)	**Supported**
H2	Economic Growth (EG) has a significant positive association with Entrepreneurship (E)	**Supported**
H3a	Digital Infrastructure (DI) mediates the relationship between Education Level (EL) and Entrepreneurship (E)	**Supported**
H3b	Digital Infrastructure (DI) mediates the relationship between Economic Growth (EG) and Entrepreneurship (E)	**Supported**

Discussion

Interpretation of Findings

The aim of this study is to analyze the links between education, economic growth, digital infrastructure and entrepreneurship development for 150 countries between 2010 and 2024. Empirical findings corroborate the Resource Based View (RBV) and suggest that Human Capital, Macroeconomic conditions and Technological Infrastructure affect the development of entrepreneurship.

The results of the analysis support the positive relationship between education and entrepreneurship (H1 supported) that confirms entrepreneurship capabilities are related to the knowledge, skills and awareness acquired from formal education. This relationship was determined to be strong across the different models' specifications, further reinforcing the role of education as a key resource of entrepreneurship. The coefficient ($\beta = 0.003$) implies that an increase in a 1 percent of tertiary education is related to an increase of 0.3 percent in new business density (in log form). Although statistically significant, this effect size is modest, and suggests that education alone may have limited effects, as the effects of complementary factors were not included in this study.

Entrepreneurship is also found to be positively associated with economic growth, although the coefficient of the association ($\beta = 0.004$) is relatively small and the association is not consistently significant across the different specifications (H2 is supported). In some robustness checks, education and digital infrastructure are shown to have a stronger connection with entrepreneurship than EG, meaning that this connection is less robust and more context dependent. It corroborates previous studies that suggest that the link between entrepreneurship and growth might be contingent on institutional and technological conditions (Urbano et al., 2020, Prieger et al., 2016, respectively).

The mediation analysis indicates that digital infrastructure significantly mediates the association between digital concepts and students' attitudes toward digital learning (H3a and H3b were supported). Digital infrastructure was the most robust positive association with entrepreneurship ($\beta = 0.070$) and was the leading predictor in most of the specifications. This implies that Internet connectivity, digital platforms and communication networks are transforming the entrepreneurial landscape by reducing transaction costs, expanding markets and fostering innovation.

The indirect effect (H3a: EL $\rightarrow$ DI $\rightarrow$ E) is statistically significant ($\beta = 0.00049$, Sobel $z = 4.30$, $p < 0.001$), accounting for the near 13.5% of the total effect of education on entrepreneurship. This is to say that education is not only a direct driver of entrepreneurship but could also be an indirect driver of entrepreneurship through the development of digital infrastructure. Education generates demand for

digital technologies and develops the skills and capabilities for the effective use of these, thereby allowing entrepreneurial activity.

The indirect effect is also present, but negative ($\beta = -0.00035$, Sobel $z = -2.27$, $p < 0.05$), and there is inconsistent or competitive mediation. The negative path (path a) between Economic Growth and Digital Infrastructure reduces the overall positive path. This is because it is found that Economic Growth directly stimulates entrepreneurship, but at the same time, it is found that there is a negative association between Economic Growth and the development of Digital Infrastructure (path a). The surprising result may be because in some situations – notably those in developing countries – the economic growth does not necessarily lead to investment in digital infrastructure, or because economic growth can be fueled by sectors not interested in digital connectivity. Or it could be an indicator that countries with high growth, but low digital infrastructure are investing in physical capital instead of digital capital. More studies are needed to investigate this finding.

Theoretical Contributions

This study makes the RBV applicable to the country level by showing how the country's human capital (education), macroeconomic conditions (economic growth), and technological assets (digital infrastructure) collectively influence entrepreneurial ecosystems. The most important theoretical contribution is the identification of digital infrastructure as a resource to conversion mechanism. Countries with high human capital and good economic circumstances have valuable resources in RBV, but they need to be used well to achieve entrepreneurial results. Digital infrastructure is an organizational capability at the national level; it allows transforming human capital and economic resources into realized entrepreneurial opportunities.

This is a new use of RBV beyond the concept of a firm application and implies that ecosystems with a robust digital infrastructure will be more able to translate their resources into entrepreneurial results. This is the first study to examine the mediating role of digital infrastructure for entrepreneurship and to explain how human capital affects the development of entrepreneurship, filling a theoretical void in the literature.

Comparison with Previous Research

Our results are consistent with the previous studies conducted on the role of education in entrepreneurship (Ahmed et al., 2023; Altwaijri et al., 2024), and the impact of digital technologies on creating opportunities for entrepreneurial activity (Elia et al., 2020; Steininger, 2018). However, this body of work adds a dimension to the literature that demonstrates some of the linkages between education and entrepreneurship are mediated through digital infrastructure. It indicates that research on direct effects only may underestimate the effects of education on entrepreneurship.

The non-monotonic nature of the relationships between macroeconomic factors and entrepreneurship is new and highlights the complexity of the relationships in question. There is a lack of coherence in previous research regarding whether there is a positive or negative relationship between entrepreneurship and economic growth (Nicola and Shaver, 2006; Prieger et al., 2016; Urbano et al., 2020), and our results offer some explanation: The positive direct effect can be counterbalanced by a negative indirect effect via the mediating role of digital infrastructure.

Limitations and Alternative Explanations

There are some caveats to note. One of the problems with our observational design is that it cannot prove causes. The possibility of reverse causality cannot be ruled out, as entrepreneurship could stimulate digital infrastructure, affect growth or drive tertiary enrollment. While we use country and year fixed effects to control for time invariant unobserved heterogeneity and common time shocks, we cannot rule out endogeneity or omitted variable bias. Instrumental variables or natural experiments could be used in future studies to enhance causal inferences.

Second, the low R^2 for the relatedness of our predictors with the within-country change in entrepreneurship over time (0.023) suggests that the relatedness between these two is weak and about as much as can be accounted for by country change. This indicates that many differences are likely due to the cross-sectional differences (between countries) and not due to the temporal differences (within countries). To note: Our findings are mostly based on the differences between countries and not within countries.

Thirdly, there are limitations in measurement. Tertiary enrollment gives an indication of quantity but not quality. New business density captures formal but not informal entrepreneurship. What is measured is the connectivity indicators and not digital literacy nor the regulatory environment. The measurement limitations can result in an underestimation of the effects.

Fourth, it is a concern that omitted variable bias might exist. The relationships we see could be confounded by institutional quality, financial development, regulatory environment, and cultural factors. These controls should be added to future studies.

Fifth, in terms of stationarity, panel unit root tests indicate that EL and DI are possibly non-stationarity leading to the possibility of spurious regression. The use of cointegration analysis or first difference specifications would be worthwhile in future research.

Conclusion, Limitations, and Recommendations

Conclusion

This research studies the association between education, economic expansion, digital infrastructure and entrepreneurship from panel data of 150 countries for 2010-2024. The empirical results confirm the Resource Based View (RBV) and contribute to the evidence that human capital, macroeconomic factors, and technological infrastructure have a role in entrepreneurial development.

The results showed that there was a significant positive association between education level and entrepreneurship, with this association being significant at the 0.001 level, indicating that the knowledge, skills and awareness gained through formal education is related to entrepreneurial capacities. Economic growth is also positive and statistically significant ($\beta = 0.004$, $p < 0.001$) and has weaker effects and inconsistent signs across the specifications.

The mediation analysis is the key contribution of this study, as it revealed that digital infrastructure plays a significant role in the mediating role. The indirect effect of education on entrepreneurship via digital infrastructure is significant (indirect effect = 0.00049, Sobel z = 4.30, $p < 0.001$), accounting for about

13.5% of the total effect. This is an affirmation that education is not only a driver of entrepreneurship but also it can drive it indirectly by developing digital infrastructure. The indirect pathway of economic growth on entrepreneurship, which is also important but mediates inconsistently (indirect effect = –0.00035, Sobel z = –2.27, $p < 0.05$), indicates that although economic growth is directly associated with the promotion of entrepreneurship, it has a negative effect on the digital infrastructure, which moderates this positive effect.

Digital infrastructure was most closely related to entrepreneurship ($\beta = 0.070$) because it has a significant impact on the entrepreneurial landscape by reducing the transaction costs of doing business, expanding markets, and fostering innovation through internet connectivity, digital platforms and communication networks. The results indicate the need for education, economic growth and digital infrastructure to be considered complementary assets in supporting entrepreneurship.

Limitations

This study employs methodologically sound approaches and evidence, but it has a number of limitations that should be noted. First, the design used in the observation does not provide evidence of causation. It is possible that the effects are bi-directional: entrepreneurship can spur digital infrastructure, or entrepreneurship can have an impact on economic growth or tertiary enrollment. There are potential endogeneity and omitted variable biases, but we have included country and year fixed effects. Second, the within R^2 for the fixed effects model is just 0.023, meaning there is relatively little variation in entrepreneurship within countries over time, due to variation in our predictors. Our conclusions are largely based on the inter-country difference in our findings, not on changes in our findings over time. Thirdly, there are limitations to measurement. Tertiary education only measures the volume of education. New business density is the measure of formal entrepreneurship but not of informal entrepreneurship. Digital infrastructure is not assessed on the basis of digital literacy or regulatory factors. Fourth, the relationships observed may be confounded by omitted variables such as institutional quality, financial development, the regulatory environment, culture and others. Fifth, the unit root tests for panel data indicate that both EL and DI are possibly non-stationary variables, which makes it possible to have spurious regressions. Sixth, the balanced panel does not contain any countries with missing data, which may lead to selection bias if the missingness is systematic. Seventh, our measure of entrepreneurship (new business density) does not reflect entrepreneurial quality, innovation, survival, or environmental and social impacts.

Recommendations for Future Research

There are several limitations to this study which warrant attention in future research. First, researchers should use instrumental variables, natural experiments, or quasi-experimental designs to bolster causal statements and dynamic panel models, such as system GMM, may be useful to deal with the endogeneity problem. Second, longitudinal studies following the same entrepreneurs over time would also offer important insights into the link between education, economic and entrepreneurial career paths. Third, hybrid methods (panel plus interview/survey) would add to the understanding of the lived experience of entrepreneurs and contextual determinants of entrepreneurial decisions. Fourth, country specific analyses examining the differential impact of the developed economy versus the developing economy are called for as availability of digital infrastructure and educational quality are widely different in these contexts. Fifth, future research should try to construct overall entrepreneurship indices that incorporate

the environmental and social effects of entrepreneurship, as well as entrepreneurial quality, innovation, and survival measures. Sixth, research into the relative importance of particular dimensions of digital infrastructure (including digital platforms, fintech and information systems) would provide better policy targeting. Finally, contextual influences in terms of institutional quality, regulatory environment, cultural values and social capital should be examined for their reinforcing or moderating role. Lastly, since some variables are not stationary, future studies can test for cointegration and error correction models should be used.

Policy Recommendations

This study's empirical results have a number of implications for entrepreneurship policies. Governments must invest in entrepreneurial education by reforming the curriculum and introducing entrepreneurship in all subjects, creating programs that give students experience in entrepreneurship and sustainable business practices, and ensuring that business is taught in a way that is relevant to the needs of their communities. Second, policy makers need to address the need to invest in digital infrastructure, including broadband networks, mobile networks and digital platforms in underserved areas. Enabling digital literacy programs and setting up regulatory mechanisms for innovation and consumer protection are also crucial. Third, education, digital infrastructure and economic growth are complementary so, policy makers should coordinate the investment in these areas to maximize the effect of the investments on entrepreneurial development. Fourth, the importance of maintaining macroeconomic stability through sound fiscal and monetary policies, through providing favorable business environments and access to finance, is still crucial in sustaining entrepreneurial activity. Finally, targeted support mechanisms – including financing schemes, certification and/or market incentives – should be implemented for business models that are effective in incorporating digital technologies and meeting social and environmental goals. These policy approaches complement each other and cover the three aspects of entrepreneurial ecosystems – the personal, the technical and the macro-economic.

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Appendix A: List of Countries Included in the Analysis

Table A1: Country List (150 Countries)

No.	Country	No.	Country
1	Afghanistan	76	Gibraltar
2	Albania	77	Greece
3	Algeria	78	Greenland
4	American Samoa	79	Grenada
5	Andorra	80	Guam
6	Angola	81	Guatemala
7	Antigua and Barbuda	82	Guinea
8	Argentina	83	Guinea-Bissau
9	Armenia	84	Guyana
10	Aruba	85	Haiti
11	Australia	86	Honduras
12	Austria	87	Hong Kong SAR, China
13	Azerbaijan	88	Hungary
14	Bahamas, The	89	Iceland
15	Bahrain	90	India
16	Bangladesh	91	Indonesia
17	Barbados	92	Iran, Islamic Rep.
18	Belarus	93	Iraq
19	Belgium	94	Ireland
20	Belize	95	Isle of Man
21	Benin	96	Israel
22	Bermuda	97	Italy
23	Bhutan	98	Jamaica
24	Bolivia	99	Japan
25	Bosnia and Herzegovina	100	Jordan

No.	Country	No.	Country
26	Botswana	101	Kazakhstan
27	Brazil	102	Kenya
28	British Virgin Islands	103	Kiribati
29	Brunei Darussalam	104	Korea, Dem. People's Rep.
30	Bulgaria	105	Korea, Rep.
31	Burkina Faso	106	Kosovo
32	Burundi	107	Kuwait
33	Cabo Verde	108	Kyrgyz Republic
34	Cambodia	109	Lao PDR
35	Cameroon	110	Latvia
36	Canada	111	Lebanon
37	Cayman Islands	112	Lesotho
38	Central African Republic	113	Liberia
39	Chad	114	Libya
40	Channel Islands	115	Liechtenstein
41	Chile	116	Lithuania
42	China	117	Luxembourg
43	Colombia	118	Macao SAR, China
44	Comoros	119	Madagascar
45	Congo, Dem. Rep.	120	Malawi
46	Congo, Rep.	121	Malaysia
47	Costa Rica	122	Maldives
48	Côte d'Ivoire	123	Mali
49	Croatia	124	Malta
50	Cuba	125	Marshall Islands
51	Curaçao	126	Mauritania
52	Cyprus	127	Mauritius
53	Czechia	128	Mexico
54	Denmark	129	Micronesia, Fed. Sts.
55	Djibouti	130	Moldova
56	Dominica	131	Monaco
57	Dominican Republic	132	Mongolia
58	Ecuador	133	Montenegro
59	Egypt, Arab Rep.	134	Morocco
60	El Salvador	135	Mozambique
61	Equatorial Guinea	136	Myanmar
62	Eritrea	137	Namibia
63	Estonia	138	Nauru
64	Eswatini	139	Nepal
65	Ethiopia	140	Netherlands
66	Faroe Islands	141	New Caledonia
67	Fiji	142	New Zealand
68	Finland	143	Nicaragua

No.	Country	No.	Country
69	France	144	Niger
70	French Polynesia	145	Nigeria
71	Gabon	146	North Macedonia
72	Gambia	147	Northern Mariana Islands
73	Georgia	148	Norway
74	Germany	149	Oman
75	Ghana	150	Pakistan