The Impact of Entrepreneurship on Economic Growth in Industrialized Countries Covering 2001-2019

L'impact de l'entrepreneuriat sur la croissance économique dans les pays industrialisés Couverture 2001-2019

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Received:22/05/2021 Accepted: 05/06/2021 Published: 30/06/2021

Abstract:

This paper aims to examine the impact of entrepreneurship on economic growth, using GDP per person employed as dependent variable, and entrepreneurship computed by Total Early-Stage Entrepreneurial Activity (TEA), Financing for Entrepreneurs (FNCENT), and Government Entrepreneurship Programs (GEP) as independent variables; and other control variables. The data consists of 28 industrialized countriescovering 2001–2019. The estimation results of an augmented Solow panel data model of 28 industrialized countries covering 2001–2019, reached to a significantly negative impact only of (TEA) in the in static model. While the dynamic panel GMM estimation indicates a significantly negative impact of (TEA), and a significantly positive impact of (GEP).

Keywords:Entrepreneurship, Economic Growth, Fixed-Effects, System-GMM.

Jel Classification Codes:L26, F43, C33, C51.

Résumé:

Cet article vise à examiner l'impact de l'entrepreneuriat sur la croissance économique, en utilisant le PIB par personne employée comme variable dépendante, et l'entrepreneuriat calculé par l'activité entrepreneuriale totale à un stade précoce (TEA), le financement des entrepreneurs (FNCENT) et les programmes gouvernementaux d'entrepreneuriat (GEP) en tant que variables indépendantes ; et d'autres variables de contrôle. Les données portent sur 28 pays industrialisés couvrant la période 2001-2019. Les résultats d'estimation d'un modèle de données de panel Solow augmenté de 28 pays industrialisés couvrant la période 2001-2019, n'ont atteint un impact significativement négatif que de (TEA) dans le modèle statique. Alors que l'estimation GMM du panel dynamique indique un impact significativement négatif de (TEA) et un impact significativement positif de (GEP).

Mots-clés : Entrepreneuriat, Croissance économique, Effets fixes, System-GMM**.**

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1. Introduction:

In the political economy, entrepreneurship is defined as a way to provide a framework to transform a great idea into a large company, through all stages of incorporation, growth and financing in an efficient and unconventional way, with a view to continuity, in order to gain profits and achieve financial independence, through the development of a start-up that creates familiarity and positive impression of customers suppliers and investors. Entrepreneurship is not easy because most new businesses - not well organized - fail. Entrepreneurial activities vary depending on the type of activity in which this emerging organization is engaged. Entrepreneurship ranges from every company (often the leader working part-time) to promises to create new jobs, Entrepreneurship is important for new firm creation, job creation in the private sector and legitimate wealth creation. Entrepreneurial policy will, therefore, encourage private sector development and offer productive alternatives to public sector employment, so, for more details we ask the following question:

Can entrepreneurship support economic growth in the industrialized countries?

In order to address the issue, the following hypotheses can be relied upon:

- 'Total Early-Stage Entrepreneurial Activity' has a strong positive statistically significant impact on economic growthin the industrialized countries.
- 'Financing for Entrepreneurs' has a moderate statistically significant impact on economic growth in the industrialized countries.
- 'Government Entrepreneurship Programs' has a statistically insignificant impact on economic growth in the industrialized countries.
- Entrepreneurship and human capital play a crucial role in the economic growth in the industrialized countries.

The main objective of this study is to investigate the role and effects of entrepreneurship as the engine of economic development, including:

- To analyse the idea of entrepreneurship and to describe other relevant principles.
- To look at entrepreneurship's relation to economic development through the creation of employment, GDP.
- To determine the role of human capital in entrepreneurship process and its impacts on economic growth.

The idea that entrepreneurship and economic growth are intimately linked and maintain favourable relationships has no doubt made its way from the work of Schumpeter. More entrepreneurs would lead to more economic growth. The effect would result from the concrete expression of the qualities of the entrepreneur and, more specifically, his propensity to innovate.

The study is an analysis of the factors behind the entrepreneurial renaissance in the industrialized countries as well as links between entrepreneurial activity and economic growth.

The purpose of our reflection is to study entrepreneurial activity, paying particular attention to the different aspects surrounding this phenomenon, to better explain the private entrepreneurial dynamic, it is better to observe the actors themselves.

2. Theoretical framework and previous studies:

The relationship between entrepreneurship and economic growth has preoccupied economists since it was recognized, following the inability of endogenous models to explain the residue, that human action would be at the origin of economic growth. On a theoretical level, two approaches have provided arguments clarifying this relationship: the Schumpeterian approach and the Neo-Austrian approach which is based on the work of (Kirzner, 1973), For Schumpeter, the entrepreneur is the driving force behind economic growth, its role in the liberal economic system consists in the implementation of new combinations, that is to say innovations. Through his innovations, the Schumpeterian entrepreneur induces imbalances in the market as part of the process of creative destruction. This creative destruction is at the origin of economic dynamism and long-term growth to the extent that the exit of certain firms on the market frees up resources previously used otherwise and makes it possible to reallocate them in new combinations, according to this approach, the effect of entrepreneurship on economic growth results from the intrinsic qualities of the entrepreneur, precisely his ability to innovate, that is to say to economically value an invention, a discovery, an idea.

This activity involves the execution of new combinations. For this, five types of innovation have been distinguished: the introduction of a new product, the introduction of a new production or sales method, the opening of a new market, the implementation of a new type of industrial organization, the conquest of a new source of raw materials.

Thanks to its various innovations, the Schumpeterian entrepreneur is looking for the creation of new profit opportunities, these can arise from increased productivity (Nzaou, 2015) so Schumpeter said : « The role of the entrepreneur is to transform or revolutionize the production pattern by exploiting an innovation, or more generally, an untried technological possibility foe producing an old one in a new way… to undertake such new things is difficult and constitutes a distinct economic function, Firstly, because they lie outside of the regular activities that everyone knows, and secondly because in many respects the world avoids » (Audretsch, 2006).

Thus, greater productivity can translate into increased competitiveness and increased growth, overall, entrepreneurship promotes economic growth through the introduction of innovations that add value. However, it should be noted that the Schumpeterian approach emphasizes the innovative entrepreneur, which suggests that it excludes from its field the self-employed without innovative vocation; while this type of so-called necessity entrepreneurship should not be overlooked as it is booming in developing countries, some of which are experiencing fairly high growth rates. The New Austrian approach to entrepreneurship, of which (Kirzner, 1973) is the main representative, focuses on the role of the entrepreneur in balancing the markets.

According to (Kirzner, 1973), the entrepreneur is an individual who sees opportunities for profit that others do not see and who uses an arbitrator to change the market balance in order to make a profit (Nzaou, 2015). (Sternberg & Wennekers, 2005) show that the relationship between entrepreneurship and economic growth is difficult to grasp since different types and different phases entrepreneurship influence economic growth. Also, the relationship is bidirectional in the sense that entrepreneurship encourages economic growth which in turn can affect the arbitration of individuals between different professional occupations including entrepreneurship.

Finally, measuring entrepreneurship is a very delicate task as there is no consensus on a reliable and practical set of indicators. Invery detailed study, (Iversen, et al., 2008)summarized the different ways to measure entrepreneurship, but the most commonly used measure is what is called "business demography", which is the creation, disappearance and evolution of the number of companies over time or their degree of volatility. Despite these limitations, numerous empirical studies have attempted to identify the effects of entrepreneurship on the economic growth of developed nations. (Audretsch, et al., 2005) show that entrepreneurship measured by the entry and exit rate of companies positively influence growth in terms of productivity. For their part, (Wennekers , et al., 2010) find that the flow of new entrepreneurs tends to decrease with the level of development at some point, to increase again from this point. (Nzaou, 2015).

(Carree & Thurik, 2003) note a paucity of theoretical frameworks linking entrepreneurship to conventionally measured economic growth, notwithstanding the numerous claims linking the two. They suggest that framework connecting entrepreneurial activity to economic growth should identify the micro-economic foundations of growth, emphasize the role of knowledge externalities in the growth process, and identify intermediate linkages from entrepreneurial activity to economic progress. They propose that knowledge spillovers facilitate innovation, which in turn drives growth. The knowledge spillover theory asserts that entrepreneurship contributes to growth by serving as a mechanism to facilitate knowledge spillover from existing activities of incumbent firms or universities to new and innovative ones. Since it encourages the spillover and commercialization of information within the established business that may otherwise have stayed stagnant and uncommercialized, entrepreneurship has a positive effect on creativity and consequently on development. (Olafsen & Cook, 2016).

Linking entrepreneurship to economic growth is certainly not new, there was many studies that try to explain the relation between the two concepts. In conventional (theoretical) economics, awareness of the value of entrepreneurial operation has been lacking for a while (Baumol, 1990). Entrepreneurship, which is impossible to capture in statistical calculations, has vanished from conventional (neo-classical) economics, and (Kirzner, 1973) who found that, in terms of product quality and price, technology, the neo-classical paradigm restricted

the entrepreneur's decision-making within constraints completely foreign to the sense in which real world entrepreneurs usually work.

In his classic treatise,"*Theorie der wirtschaftlichenEntwicklungen* (Theory of Economic Development)"**,** (Schumpeter, 1931) proposed that entrepreneurs starting new businesses provided the engine for economic growth, Even in his 1942 classic, "Capitalism, socialism and Democracy"**,**he saw that progress itself can be "mechanized" just as well as managing a stationary economy and this mechanization of progress is likely to affect individual initiative (entrepreneurship) and capitalist society almost as much as stopping economic progress. To demonstrate this, it suffices to note, firstly, what constitutes the function of entrepreneur and, secondly, what it means for bourgeois society and from the point of view of the survival of the capitalist regime, Schumpeter said: « The role of businessmen is to restructure or revolutionize the production pattern by exploring an invention, or more generally, an untried technological possibility for producing a new commodity or producing an old one in a new way... To undertake such new things is difficult and constitutes a distinct economic function, first because they are beyond the routine tasks that everyone understands, and second because the environment in many respects is resistant».

(Baumol, 1990) in his study, "« entrepreneurship: Productive, unproductive and destructive »", distinguished between many forms of entrepreneurship. Baumol mentions that entrepreneurs are individuals who are clever and inventive to find means to increase their wealth, strength and reputation, and he contends that it is to be anticipated that not all of them will be deeply concerned as to whether the activity that accomplishes these objectives adds much or little to the social product or, in that respect, whether it is a real obstacle to production. Baumol focused on «Schumpeterian innovative entrepreneurs » that coexist with « defensive and necessity entrepreneurs », the latter are those who join a new business, not because of market opportunities and creative ideas, but just because they need revenue to survive, for obvious reason, this kind of « survival –driven » self-employed is particularly diffused in the developing countries.

In his research:" « entrepreneurship and economic growth: an empirical analysis »" (Salgado-Banda, 2005) is proposing a new variable to proxy for productive entrepreneurship based on patent data. Self-employment data is used as an alternative representative. In particular, he studies the impact of entrepreneurship on economic growth through the use of these two measures. The research examines 22 OECD countries and discovers a significant relationship between the selected measure of productive entrepreneurship – the degree of innovation of different countries – and economic growth, while the alternative measure, due to self-employment, appears to be negatively correlated with economic growth.

In her thesis titled: "« The role of entrepreneurship as the driver of economic growth »", (Ogunlana, 2018) tries to examine the impacts of entrepreneurship on economic growth, also, analyses challenges faced by business start-up or small and medium enterprises. The study found that entrepreneurship can play an important

role in accomplishing economic growth in a country that overcomes its economic crisis, generates employment, innovations, increases production and diversifies the revenue stream of the economy while encouraging the development of small and medium-sized enterprises.

In their study « Institutional factors, opportunity entrepreneurship and economic growth: panel data Evidence », (Aparicio, et al., 2016) explore the institutional factors that encourage opportunity entrepreneurship in order to achieve higher rates of economic growth, They suggest that institutional factors which affect productive behaviour, such as entrepreneurship, are not automatically affected as it is usually assumed in models of endogenous growth, rather than as a means of conducting institutions in society. Thus, entrepreneurship opportunities are identified as one mechanism which affects economic growth. Using a three-stage, least-square method using unbalanced panel data from 43 countries (2004-2012), informal institutions have a higher impact on opportunities for entrepreneurship than formal institutions. Variables such as corruption control, faith in one's ability and private publicity to gain credit encourage the beneficial impact of entrepreneurship opportunities

3. Data and Methodology:

1.3. Data:

To analyse the contribution of different types of entrepreneurship to economic growth,we considered a sample of 28industrialized countries (Appendix 1). We chose the countries according to the availability of data for the variables considered in the analysis. For each country we have considered a set of indicators measuring economic growth, the entrepreneurial activity, and the macroeconomic conditions.

The dependent variable in our study is GDP per person employed, which represents one of the most important indicators of economic growth. Data on this indicator was obtained from the World Bank's World Development Indicators (WDI) database (World Bank, 2020). Our key explanatory variables are entrepreneurial activity at the country level comes from Global Entrepreneurship Monitor -GEM, measured by Total Early-Stage Entrepreneurial Activity (TEA), Financing for Entrepreneurs (FNCENT), and Government Entrepreneurship Programs (GEP). The Global Entrepreneurship Monitor (GEM) is a research program that focuses on a major driver of economic growth: entrepreneurship. The GEM research program, initiated in 1998, provides the required fundamental knowledge by assembling relevant harmonized data on an annual basis(Reynolds et al, 2005).

In our econometric model, we have included, in addition to the variables mentioned above, several control variables. The control variables are represented by different factors, suggested by the theories of economic growth, that would affect the economic growth: the investment ratio (proxied through the gross capital formation), knowledge (measure by Human Development Index), the Index of Economic Freedom

(ECFR), and $(n + g + \delta)$. In Table 1, we describe the dependent, independent, and control variables used in this study, including their definition and sources.

Table 1. Description of the variables considered in the analysis.

Variable	Definition	Source
Dependent Variable		
GDP per person employed (GDPppe)	GDP per person employed is gross domestic product (GDP) divided by total employment in the economy. Purchasing power parity (PPP) GDP is GDP converted to 2017 constant international dollars using PPP rates.	International Labour Organization
Independent variables		
Total Early-Stage Entrepreneurial Activity (TEA)	Percentage of 18-64 population who are either a nascent entrepreneur or owner-manager of a new business	Global Entrepreneurship Monitor -GEM
Financing for Entrepreneurs (FNCENT)	The availability of financial resources—equity and debt—for small and medium enterprises (SMEs) (including grants and subsidies)	
Government Entrepreneurship Programs (GEP)	The presence and quality of programs directly assisting SMEs at all levels of government (national, regional, municipal)	
Control variables		
Gross capital formation (GCF)	Gross capital formation (formerly gross domestic investment) consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories. Data are in constant 2010 U.S. dollars.	World Bank
The Index of Economic Freedom (ECFR)	The Index of Economic Freedom focuses on four key aspects of the economic environment over which governments typically exercise policy control: Rule of law, Government size, Regulatory efficiency, and Market openness.	The Heritage Foundation
Human Development Index (HDI)	A composite index measuring average achievement in three basic dimensions of human development—a long and healthy life, knowledge and a decent standard of living.	Human Development Reports-UNDP
$(n + g + \delta)$	*n* the rate of labour force growth, *g* is the rate of technological progress and δ is the rate of depreciation.	International Labour Organization,

Source: authors' elaboration

3.2. Estimation Strategy:

The relationship between entrepreneurship and economic growth has been widely explored (Acs, et al., 2012) ; (Audretsch, & Keilbach,, 2008) ; (Acs, et al., 2018) ; (Noseleit, 2013). In this study, we estimate the augmented Solow model using panel data of 28 industrialized countries covering 2001-2019. In the Solow model, per person employed output growth depends on Total Early-Stage Entrepreneurial Activity, Financing for

Entrepreneurs, Government Entrepreneurship Programs, Gross capital formation, Economic Freedom, Human Development Index, and $(n + g + \delta)$.

$$\ln GDPppe_{it} = \alpha + \beta_1 \ln TEA_{it} + \beta_2 \ln FNCENT_{it} + \beta_3 \ln GEP_{it} + \beta_4 \ln GCF_{it} + \beta_5 \ln ECFR_{it} + \beta_6 \ln HDI_{it} - \beta_7 \ln(n + g + \delta)_{it} + \tau_t + \eta_i + \varepsilon_{it} \quad \text{.....(1)}$$

Following the appendix of (Acs, et al., 2012) to linearize the production function, we use the natural logarithm in the dependent and independent variables in our growth model. According to (Wooldridge, 2013), Models using the logarithm on both sides (dependent and independent variables) cause their coefficients to be explicitly represented in terms of the percentage change in the independent variable, which implies a difference in the dependent variable represented by the coefficient concerned.

In this study, the impact of different types of entrepreneurial activity on economic growth is empirically tested using a panel data setting, covering 28 industrialized countries over the period 2001-2019. The selected empirical strategy is subject to theoretical considerations, dataset structure, and the potential econometric issues that need to be dealt with in this investigation. The use of panel data is the first remedy to address some the above-listed issues in the entrepreneurship-economic growth relationship. This study follows the previous research practice which suggests that static estimators, namely fixed effects (FE) and random effects (RE) are more commonly used in panel data analysis. The suitability of the two alternative estimators is assessed on theoretical basis, the relationship to be investigated, the type of the data (heterogeneity; unobserved effects) and on the diagnostics tests. Random effects (RE) estimator is preferred in situations where the unobserved country effects are assumed to be uncorrelated with the included regressors (Gujarati, 2004). In the other hand, the fixed effects (FE) estimator accounts for such correlation between the unobserved heterogeneity and explanatory variables in the model, within each cross-sectional observation, i.e., between countries. The FE rather than the RE is more frequently applied in the entrepreneurship-economic performance literature. Favouring the use of FE, (Wooldridge, 2013).

The study relies on Hausman test to confront the decision of which is the most appropriate estimator for this investigation (Hausman, 1978). The null hypothesis states that there are no systematic differences between the two estimators, i.e., that the RE model is valid. A rejection of the null hypothesis suggests that the fixed effects (FE) is preferred over the random effects (RE) (Baltagi, 2005). Pesaran CD (cross-sectional dependence) test is used to test whether the residuals are correlated across entities. Cross-sectional dependence can lead to bias in tests results (also called contemporaneous correlation)(Pesaran, 2004). Modified Wald statistic is used to test for groupwise heteroskedasticity in the residuals of a fixed effect regression model. The modified Wald statistic is workable when the assumption of normality is violated, at least in asymptotic terms (Greene, 2000). A number of tests for serial error correlation in panel data models have been proposed in the literature. HR-test is used to

test the first order serial correlation in fixed effect panel data models without gaps (Born & Breitung, 2016), (Wursten, 2018).The vast majority of panel data growth studies use a fixed effect (within-group) estimator rather than a random effects estimator. The use of panel data methods to address unobserved heterogeneity can bring substantial gains in robustness, but is not without costs. The fixed-effects identification strategy cannot be applied in all contexts. Sometimes a variable of interest is measured at only one point in time. Even where variables are measured at more frequent intervals, some are highly persistent, in which case the within-country variation is unlikely to be informative. Given the potentially unattractive trade-off between robustness and efficiency, (Barro & Sala-i-Martin, 1997), (Temple, 1999), and (Wacziarg, 2002) all argue that the use of fixed effects in empirical growth models has to be approached with care. The price of eliminating the misleading component of the between variation – namely, the variation due to unobserved heterogeneity – is that all the between variation is lost. There are alternative ways to reveal this point, but consider the random effects GLS estimator of the slope parameters, which will be more efficient than the within-country estimator for small Twhen the random-effects assumptions are appropriate. This GLS estimator can be written as a matrix-weighted average of the within-country estimator and the between-country estimator, which is based on averaging the data over time and then estimating a simple cross-section regression by OLS (Durlauf, et al., 2005). To address some the above empirical issues and to ensure econometric validityand statistical inference, (Hoechle, 2007) suggests using (Driscoll & Kraay, 1998) standard errors adjusted for unbalanced panel data. (Hoechle, 2007) argues that "*Driscoll-Kraay standard errors are well calibrated when theregression residuals are cross-sectionally dependent*". Since lag occupies a central role in economics and is clearly reflected in the short-run and long-run methodology of economics (Gujarati, 2004), and getting valid (external) instruments both from theoretical and empirical point of view is very difficult, We decided to use the Generalized Method of Moments (GMM), which permits one or more lags of the dependent variables are included as explanatory variables, in order to display the effect of entrepreneurship on growth adjusting over time towards the long-run equilibrium. Moreover, this method helps us solve the problems of endogeneity, simultaneity bias, reverse causality and omitted variables that may weaken the results from static panel data method. There are two GMM approaches: the first is the difference GMM (DIF-GMM) and the second is system GMM (SYS-GMM). The DIF-GMM developed by (Arellano & Bond, 1991) uses past values of the regressor in levels as instruments of the differenced dependent variable. The SYSGMM combines equations of the first differences instrumented by lagged levels with an additional set of equations in levels instrumented by lagged first-differences (Arellano, & Bover, 1995); (Blundell & Bond, 1998).The dynamic augmentedSolow growthequation we wish to estimate has the following form:

$$\ln GDPppe_{it} =$$
$$\alpha + \beta_1 \ln GDPppe_{it-1} +$$

$\beta_2 \ln TEA_{it} + \beta_3 \ln FNCENT_{it} + \beta_4 \ln GEP_{it} + \beta_5 \ln GCF_{it} + \beta_6 \ln ECFR_{it} + \beta_7 \ln HDI_{it} - \beta_8 \ln(n + g + \delta)_{it} + \tau_t + \eta_i + \varepsilon_{it}$ .....(2)

Where α is a constant term, β_1 to β_8 are the parameters to be estimated and ε_{it} is the error term which represents the effect of omitted variables that are particular to each country and period.$\tau_t$represents year dummies, and $\eta_i$stands for country fixed effect.

The potential endogeneity between entrepreneurial activity measures and economic growth is however, accounted for by using "system GMM". In addition, the System GMM, developed by (Arellano, & Bover, 1995) and, accounts for the "dynamics ofadjustment", which according to (Bond, 2002) help improve the estimated consistency of the coefficients and of the model.

Consequently, Bond suggests including the lagged dependent variable even when researchers are not primarily concerned with its impact on the dependent variable. Moreover, (Roodman, 2009)claims that, besides accounting for endogeneity, GMM modelsare also robust to heteroscedasticity and serial correlation, within the unit of analysis (countries),and allow relaxing the normality of error terms. Further, the superiority of system GMM estimator is thatit combines the equation in first differences with the equation in levels(Blundell & Bond, 1998).

The superiority of system GMM compared to the first-differenced GMM is furtherdemonstrated by (Bond, Hoeffler, & Temple, 2001). Among other advantages, system GMMoutperforms difference GMM by providing better finite sample properties. The finite sample bias, or the bias due to "weak instruments" in this investigation, might be further influenced by the small sample size (especially small time-series) and persistent explanatory variables.According to (Bond, Hoeffler, & Temple, 2001) the two conditions are a typical characteristic of empirical growth models.

Further, the time-invariant variables, identified above, would remain in the model only when system GMM is applied and would be dropped in the difference GMM, thus reducing its explanatory power and casting doubts on economic inference.

4.Results: in this part, empirical results of the relationship between entrepreneurship and economic growth using both static and dynamic approach estimation methodologies, explained in the previous parts, are provided. Entrepreneurship measures are grouped into three main categories, namely 'Total Early-Stage Entrepreneurial Activity', 'Financing for Entrepreneurs', and 'Government Entrepreneurship Programs'.

4.1. Descriptive statistics: Table 2 displays the correlation and multicollinearity tests of the variables that are included in the analysis.

Table 2. Correlation and Multicollinearity tests.

	LGDPppe	LTAE	LFNCENT	LGEP	LGCF	LECFR	LHDI	L_n_g_δ
LGDPppe	1							
LTAE	-0.4501	1						
LFNCENT	0.1682	0.0679	1					
LGEP	0.3701	0.0117	0.5162	1				
LGCF	-0.1124	-0.0639	0.1645	0.133	1			
LECFR	0.6203	-0.0456	0.4607	0.506	-0.0654	1		
LHDI	0.916 -	0.3421	0.2029	0.422 -	0.0143	0.6296	1	
L_n_g_δ	-0.1532	0.3757	0.2256	0.2116	0.1170	0.2748	0.0928	1
VIF		1.46	1.58	1.68	1.11	2.30	2.13	1.35
1/VIF		0.6848	0.633	0.596	0.899	0.434	0.47	0.742

Source: authors' elaboration based on STATA16 outputs

included in the specified econometric models suffer from high correlation. Table 2 displays the descriptive statistics of correlation among the dependent and the independent variables. There is no strong correlation among the independent variables, just a moderate correlation between 'LECFR' and 'LHDI' (0.6296), 'LGEP' and 'LECFR' (0.506), 'LFNCENT' and 'LGEP' (0.5162). While the rest of the correlations were between below-moderate to weak. After considering the above outlined correlation issues, the variance inflation factors (VIFs) of some variables are above 10, thus indicating that there are problems of multicollinearity. The variance inflation factors (VIFs) are below 10, thus indicating that there are no problems of multicollinearity.

4.2. Static analysis: Table 3 displays the estimation results of Pooled, Fixed-effects and Random-effects, Poolability test and (Hausman, 1978) test.

Table 3. Estimation results of Pooled, Fixed-effects and Random-effects

	Pooled		Fixed-effects		Random-effects	
	Coef.	**P>|t|**	**Coef.**	**P>|t|**	**Coef.**	**P>|t|**
LTAE	-.1008059	0.000	-.0371019	0.000	-.0444272	0.000
LFNCENT	-.0279558	0.565	.000464	0.980	.0074093	0.720
LGEP	.0329718	0.539	.0122931	0.605	.025864	0.318
LGCF	-.036895	0.000	.2031292	0.000	.1411026	0.000
LECFR	.7730528	0.000	.1825217	0.002	.2622096	0.000
LHDI	3.913865	0.000	1.987457	0.000	2.407291	0.000
L_n_g_δ	-1.475982	0.000	-1.430424	0.000	-1.448746	0.000
_cons	15.80256	0.000	11.32422	0.000	12.75993	0.000
	F (7, 524) =885.40	Prob> F =0.00	F (7,497) =407.95	Prob> F =0.00	Wald chi2(7) =2506.88	Prob>chi2 =0.00
R-squared	0.9220		0.8518		0.8444	
	F test that all u_i=0: F (27, 497) = 195.33 / Prob> F = 0.000			**Hausman test:** chi2(7) = 368.89 / Prob>chi2 = 0.000		

Source: authors' elaboration based on STATA16 outputs

It is evident from the outputs of the previous table that the comparison between the pooled model and the fixed effects model based on the restricted Fisher statistic (F) test, which indicates the rejection of the null hypothesis and acceptance of the alternative hypothesis, meaning that the fixed effects model is the best.

After obtaining the estimates of the random effects model, it is required to perform a (Hausman, 1978) test for the comparison between the fixed effects model and the random effects model.

The output of the previous table shows the rejection of the null hypothesis and acceptance of the alternative hypothesis, meaning that the fixed effects model is the best. The next step is to run the diagnostic tests for the fixed effects model.

Table 4. Fixed-effects diagnostic tests

Pesaran's test of cross-sectional independence	Modified Wald test for groupwise heteroskedasticity in fixed effect regression model	Heteroskedasticity-robust Born and Breitung (2016) HR-test
-0.442, **Pr = 0.6588**	chi2 (28) = 19808.23 Prob>chi2 = 0.0000	HR-stat = -1.41 p-value = 0.159

Source: authors' elaboration based on STATA16 outputs

The result of the (Pesaran, 2004) test indicates the acceptance of the null hypothesis, which denotes that the model is devoid of the problem of cross-sectional dependence. According to the results of the modified Wald test above, we reject the null hypothesis and conclude heteroskedasticity.

The (Born & Breitung, 2016) HR-test indicatesthe rejection of the null hypothesis and the residuals do not have the first-order autocorrelation. Diagnostics tests of the specified model suggest the presence of heteroscedasticity, and the absence of serial correlation and cross-sectional dependency.

The modified Wald test for group-wise heteroscedasticity in the fixed effects regression model indicate the presence of heteroscedasticity (p-value=0.000). The fixed effects estimator is either inconsistent, biased, or inefficient in the presence of heteroscedasticity.

To illustrate this, heteroscedasticity would make the estimates inefficient and their standard errors biased. Following (Baltagi, 2005), to correct for such bias in the standard errors, robust standard errors, and (Driscoll & Kraay, 1998) standard errors must be used.

Table 5. Estimation results of robust, andDriscoll- Kraay standard errors

	Driscoll-Kraay standard errors fixed effects		Robust standard errors fixed effects	
	Coef.	P>|t|	Coef.	P>|t|
LTAE	-.0371019	0.010	-.0371019	0.105
LFNCENT	.000464	0.980	.000464	0.990
LGEP	.0122931	0.617	.0122931	0.845
LGCF	.2031292	0.000	.2031292	0.000
LECFR	.1825217	0.095	.1825217	0.147
LHDI	1.987457	0.000	1.987457	0.000
L_n_g_δ	-1.430424	0.000	-1.430424	0.000
_cons	11.32422	0.000	11.32422	0.000
	F(7, 18) = 20473.60	Prob> F = 0.000	F (7,27) = 19.54	Prob> F = 0.000
R-squared	0.8518		0.8518	

Source: authors' elaboration based on STATA16 outputs

The result of the robust fixed effect model used to solve the heteroscedasticity problem differs from the fixed effect regression model.

Although the value of the coefficient of determination remained the same, the number of statistically significant variables decreased from five to three. The result of the Driscoll-Kraay standard error model used to solve the heteroscedasticity problem differs from the fixed effect regression model and the robust fixed effect model.

Although the value of the coefficient of determination remained the same, the number of statistically significant variables remain steady in five.Only The coefficient of one of the three entrepreneurship measures: 'Total Early-Stage Entrepreneurial' has a significantly negative impact in explaining variation in output per person employed.

The coefficients of all control variables are statistically significant: 'Gross capital formation', 'The Index of Economic Freedom', and 'Human Development Index' have positive impacts in explaining variation in output per worker; however, '(L_n_g_δ)' has a negative impact in explaining variation in output per person employed.

3.3. Dynamic analysis:

We are now considering the results of the application of GMM to the estimation of the augmented Solow growth model. Historically, researchers have frequently reported one-step findings in addition to two-step results owing to a downward bias in computed standard errors in two-step results.

But (Windmeijer, 2005) finite-sample correction to the reported standard errors in two-step estimation, greatly reduces this problem (Roodman, 2009). The estimated results of the two-step system GMM are presented in Table 6.

Table 6. Two-step system-GMM Estimation Results

	Coef.	P>|t|
LGDPppe(t-1)	.4899791	0.001
LTAE	-.0260241	0.031
LFNCENT	.0174725	0.624
LGEP	.1787268	0.005
LGCF	.1392862	0.006
LECFR	-.1797017	0.267
LHDI	.6041215	0.056
L_n_g_δ	-1.866612	0.002
_cons	10.41573	0.002
Arellano-Bond test for AR(1)	z = -1.63	0.103
Arellano-Bond test for AR(2)	z = -0.11	0.914
Hansen test	chi2(1) = 1.74	0.187
F(16, 27)	327.03	0.000

Source: authors' elaboration based on STATA16 outputs

There are two diagnostic tests associated with the dynamic panel GMM: the over-identification test Sargan/Hansen, which can test the validity of the lagged variables as instruments, and the (Arellano & Bond, 1991)

test for autocorrelation where the null hypothesis is the absence of autocorrelation of the first order errors in the level equation. The results of both tests in Table 6 fail to reject both H_0 of validity of the lagged variables as instruments and no autocorrelation of the second order provides a justification for the model specification.

The final diagnostic check for the dynamic approach is with regard to the coefficient of the lagged dependent variable. The lagged dependent variable suggests for convergence and has a coefficient of less than one (<1). According to (Roodman, 2009) a coefficient of 1.00 would suggest 'unstable dynamics'. The coefficient of the laggedoutput per person employed in this model shows the significance of including this variable, and its value less than one (0.49) confirms that there is clear evidence of conditional convergence.

Only two coefficients of the three entrepreneurship measures; 'Total Early-Stage Entrepreneurial', and 'Government Entrepreneurship Programs', have significant impacts in explaining variation in output per person employed even after controlling for an unobserved individual (country) specific effect. Similarly, we also identified asignificantly negative impact of $l\_n\_g\_\delta$ as expected as well which implies that the specifications are correct.The coefficient of the 'Human Development Index' expressing human capital in the augmented Solow model,has expected sign and significant effectsindicating strong evidence of faster convergence.

Compared with Solow model, inclusion of 'Human Development Index' variable in the regression leads to several important changes in augmented Solow model. The coefficient of 'The Index of Economic Freedom' becomes statistically insignificantin the dynamic estimation.

5. Discussion and Conclusion :

The interaction between entrepreneurship and economic growth has been analysed in the sense of growth theories, especially neoclassical, endogenous and Schumpeterian growth theories.Much of the recent academic works have applied either directly or indirectly one of the paradigms of economic growth to the entrepreneurial/economic growth relationship in their assessment.

Systematic studies of scientific literature, in general, have shown a significant effect on economic growth by entrepreneurship. Growth theories and models, and the research literature linking entrepreneurship to economic growth showed a lack of unanimity, although the number of studies demonstrating positive effects was dominant.

In the background of this article, we analysed the impact of entrepreneurship on economic growth in 28 industrialized countries covering2001-2019. The choice of entrepreneurship and economic growth indicators was driven by the calculation and description of the changes needed and the literature review.

The results using the static approach estimators, suggested that only the coefficient of one of the three entrepreneurship measures: 'Total Early-Stage Entrepreneurial' has a significantly negative impact in explaining variation in output per person employed. While the dynamic model using the syst-GMM approach, recorded the significant effect of two of the three variables of entrepreneurship: a significantly negative impact of 'Total Early-Stage Entrepreneurial', and a significantly positive impact of 'Government Entrepreneurship Programs'.

Total Early-Stage Entrepreneurial (TEA) is related to an inverse relationship with the output per person employed, and the variable is characterized by the fact that it includes the total of emerging businesses and new projects, and these businesses may not embody the advantage of innovation and entrepreneurship. In addition to its lack of optimal utilization of the available possibilities, available resources, and opportunities, with the possibility that the pillars of entrepreneurial activity and entrepreneurial ambition of technical readiness, the innovation of new technologies, new goods, and services, in addition to competitiveness and the ability to spread internationally, may not materialize, which leads to these projects defaulting or bankruptcy and incurring financial losses.

Government entrepreneurship efforts and programs aimed at encouraging, motivating, and accompanying businesses contribute to facilitating the obstacles facing such new projects, in addition to the importance of incubation, rehabilitation, training, and training programs accompanying these government programs, which usually include helping institutions develop knowledge and skills and acquire new methods of production and financing Innovative projects programs, in addition to protecting intellectual property rights and

patents, in addition to providing these institutions with the necessary information regarding the division of the local and international market and the competitive position of sectors and products in these markets.

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6.Appendices:

	GDPppe	TAE	FNCENT	GEP	GCF	ECFR	HDI
Argentina	53255.34	13.98947	2.009444	2.271667	6.53e+10	52.37368	.8198421
Australia	91333.99	11.40842	2.838462	2.6	2.93e+11	80.63684	.8923158
Belgium	118079.1	5.006842	3.148462	2.786154	1.14e+11	69.13158	.9092632
Brazil	31549.76	15.84895	2.384211	2.262632	4.03e+11	57.58947	.7279474
Canada	87514.13	11.76474	3.134167	2.9525	3.77e+11	77.86842	.9036842
Chile	48230.42	19.60895	2.372353	2.790588	4.79e+10	77.37368	.8134211
China	16742.3	13.94947	2.739286	2.707857	2.76e+12	53.31579	.6895263
Finland	99488.22	5.92421	2.974118	2.990588	5.78e+10	73.36316	.9144737
France	103633.5	5.004737	2.778333	3.1875	6.14e+11	62.27368	.8785263
Germany	101193.4	4.986316	2.930526	3.467895	7.06e+11	71.56316	.9238421
Greece	83114.21	7.000526	2.287059	2.07	5.00e+10	58.22632	.8605263
India	12479.96	11.18237	3.183846	2.648462	6.09e+11	53.61579	.5781053
Ireland	132870	8.61079	2.919474	3.337368	6.74e+10	79.65789	.9138947
Italy	112686.7	4.338684	2.464706	2.310588	4.26e+11	62.22105	.9138947
Japan	75874.13	3.741579	2.625455	2.460909	1.39e+12	71.07895	.8904737
Mexico	45283.78	12.58368	2.414615	2.867692	2.43e+11	65.40526	.7497895
Netherlands	103662.6	7.460526	3.22625	3.0725	1.81e+11	74.90526	.9167368
Norway	119010.1	7.37	2.742941	2.936471	1.12e+11	69.51579	.9387368
Russia	47872.85	4.5275	2.135	2.116667	3.41e+11	52.09474	.7816316
South_Africa	43354.18	7.59079	2.632941	2.12	7.19e+10	63.11053	.6608421
South_Korea	67515.54	10.60763	2.536429	2.913571	3.72e+11	69.88421	.8825789
Spain	91912.81	5.870526	2.381053	2.942105	3.30e+11	68.0421	.8714737
Sweden	99042.88	5.643684	2.824286	2.774286	1.19e+11	71.67895	.9196842
Switzerland	116573.6	7.117632	3.112	3.339333	1.36e+11	80.11579	.931421
Thailand	25397.71	19.92825	2.911538	2.411538	8.43e+10	64.79474	.7225263
Turkey	67448.69	10.00868	2.329091	2.292727	2.25e+11	60.25263	.7453158
United_Kin~m	89843.3	7.146316	2.898889	2.693333	4.38e+11	77.34211	.9072632
United_Sta~s	116539.9	11.89895	3.384211	2.835789	3.21e+12	77.95789	.9112632