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Impact of Entrepreneurship on Economic Growth

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Abstract

Increasing trend of entrepreneurship across the globe may lead to higher economic growth. The trend and impact, however, may vary across different countries depending upon level of income. This study aims to analyze the impact of entrepreneurship on economic growth while considering control variables, as suggested in previous literature. Proxies of entrepreneurship taken in the estimations are business density, patent applications, and self-employment. Previous studies have estimated impact of entrepreneurship on economic growth but this study analyzes this impact for a large panel distributed in high- and middle-income countries with multiple proxies. Using the panel data for high- and low-income countries for each of the three proxies separately, six models are estimated. The most appropriate technique for estimation, based on pre and post estimation tests, is found to be fixed effect model except for one where random effect model is appropriate. Estimation results conclude that entrepreneurship has insignificant impact on economic growth. It may be due to insufficient entrepreneurship proxies. Differences in income and impact of control variables are too significant to explain variations in economic growth. This paper recommends to explore and develop comprehensive proxy of entrepreneurship and identify reasons behind lower effectiveness of entrepreneurial activities on economic growth.

Keywords: Entrepreneurship, economic growth, panel data estimation

Introduction

Entrepreneurship is a growing activity in the contemporary business world. Establishment of various venture capital have heightened entrepreneurial activities across different regions on the globe. It is being regarded as an essential source for employment generation and capital formation and thus expected to increase the economic output of a country or region. Entrepreneurial activities are

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also on the rise in Pakistan. Several initiatives have been taken by governments, private sector, individuals, and other institutions in and outside the country. These include establishing incubations centers, financing arrangements, mentorship, ease-of-doing-business etc.

The entrepreneurial activities are increasing, but the pace of their progress and acceptance among various stakeholders may be different due to several economic, social, geographical, and governance factors. According to the annual reports of Ease of Doing businesses, the European and Pacific regions have high entrepreneurial activities due to favorable economic conditions and business environment. Regions like low-income countries are facing challenges in developing conducive environment for entrepreneurial activities due to lack of resources and technological advancements. While the high-income regions are outdoing in new business formation because of better access to resources.

Apart from the diversity in the impact of entrepreneurship across countries, entrepreneurship has multiple definitions. For instance, Joseph Schumpeter has called an entrepreneur as an innovator. Others have extended the idea and have considered an entrepreneur as the center of attention in a firm and has a heavy responsibility in a society (Baumol, 1968). The 21st century Global Entrepreneurship Monitor defines it as "entrepreneurship is any attempt at new venture or business creation, such as self-employment, a new business organization or the expansion of an existing one by an individual, a team of individuals or an established business." Due to the extensive nature of entrepreneurship, several proxies are used to represent this concept including self-employment, new business density, patent application, and research and development etc.

Rationale of Research

Despite the importance and growing wave of entrepreneurship it is difficult to deduce if it has made a significant contribution to economic growth. And if it is so, whether the impact has any heterogeneity across countries on the basis of income level.

Scope of Research

This research uses different proxies of entrepreneurship as discussed in various previous researches. It does not aim to develop or introduce any new definition or proxy for entrepreneurship. Similarly, control variables for economic growth are explored from previous papers. Income-wise classification of countries is taken as per the World Bank. It focuses on only World Development Indicators data to ensure consistency in the data formation.

Research Objectives

Therefore, this paper endeavors

1. To identify the proxies used for entrepreneurship and the determinants of economic growth in the previous literature. The determinants are used as control variables in this paper.

2. To study the impact of entrepreneurship on economic growth and seeks its heterogeneous impact across different groups of countries including high (HIC)-, middle (MIC)-, and low (LIC)-income countries.

Significance of Research

This paper contributes to the literature by providing insights about the heterogenous impact of entrepreneurship on economic growth, which can direct the researchers to deeply identify the causes of the varying behavior. With multiple proxies of entrepreneurship, it also indicates the significance of their impact on economic growth. This can help countries to make policy focusing on high-impact proxies to improve economic growth. This work can also be beneficial for entrepreneurial societies and organizations as it can provide them insight from the relationship between entrepreneurship and economic growth.

Limitation of Research

This research intended to take data for high- middle- and low-income countries but due significant amount of missing data low-income countries are dropped from the research. Data of a proxy of entrepreneurship, research and development was also missing for majority of countries therefore it is found necessary to be dropped.

Rest of the paper follows four sections. Section-2 presents literature review, section-3 outlines the methodology and explains data, section-4 discusses estimation results, and the last section provides conclusions and policy recommendations.

Literature Review

Literature review following in this section is specifically intended to identify the proxies for entrepreneurship and determinants of economic growth as well as reviewing previous studies relevant to this paper.

Entrepreneurship

The evolution of the meaning of entrepreneurship stems back to the times of neoclassical economics. Due to the diversity of its nature, it has various explanations and definitions. It can be interpreted as a risk-taking capability or may be explained as an innovation in the firm. Some researchers consider it an individual level activity like self-employment while others take it as a regional phenomenon (Bordo & Murphy, 1989). The work of Joseph Schumpeter, who came to be known as Father of Entrepreneurship, provides the Theory of Economic Development. According to the theory, the entrepreneur is someone who tries new combinations thus affects the economic growth. He regards innovation as the creation of new industrial structure and demolishment of previous one (Schumpeter & Backhaus, 2006). His perspective was later extended by Baumol who takes an entrepreneur as "Schumpeterian innovator" and a person who exercises leadership (Baumol, 1968).

Table 1: Definitions of Entrepreneurship

Authors	Definitions	Source
J. Schumpeter	Entrepreneurs are often the guiding force behind creative destruction because they advance the new products, technology, and/or production methods that provide an impulse for change.	(Schumpeter & Backhaus, 2006)
William Baumol	Persons who are ingenious and creative in finding ways to augment they're on wealth, power, and prestige.	(Baumol et al., 2006)
The World Bank	New businesses registered are the number of new limited liability corporations registered in the calendar year.	World Development Indicator
Global Entrepreneurship Monitor (GEM)	Any attempt at new business or new venture creation, such as self-employment, a new business organization, or the expansion of an existing business, by an individual, a team of individuals, or an established business.	GEM Website

Source: Authors' compilation

The first variable of entrepreneurship used in earlier research is self-employment (Parker, 2004), (Blanchflower, 2000). The variable of patent applications and research and development has also been used under the framework of Schumpeterian innovation. (Zhou & Luo, 2018). The recent variable of entrepreneurship is New Business Density from World Bank.

Proxies for Entrepreneurship

The new business entry density is the number of newly registered limited liability corporations per calendar year. New business density as a proxy of entrepreneurship shares a complex relationship of new businesses development with country's economic growth. It can not only solve low economic growth, but also solve the problems of unemployment and poverty (Botha et al., 2006). Galindo & Méndez (2014) notes that entrepreneurship, innovation, and economic growth are closely related. Moreover, Fritsch & Mueller (2004) elaborates that when new companies enter a market, they can have direct and indirect effects on the economic performance of the market. According to (Fritsch & Falck, 2007) a considerable part of the establishment of the new businesses is related to the region's innovation activities and forms part of the region's innovation system, their study analyzes that the regional workforce is the chief source of new projects. The impact of new business formation increasing in urban areas, however, it may not be so profound in rural areas (Van Stel & Suddle, 2008). It can be argued that New Business Density is closer to the concept of a new startup as compared to self-employment. (Dohse & Vaona, 2018) concludes that entrepreneurship is not a panacea for automatically reducing the unemployment rate, but the business environment is very important, not only for the formation of new companies, but also for the labor market. On the other hand, when we talk about economic well-being the increasing business density can reduce poverty and narrow the gap between rich and poor.

Self-employment is the simplest measure of the entrepreneurship which is widely used in the government and world-wide surveys (Katz, 1990). Self-employment is described as an opportunity for individuals to be their own boss and work according to their schedule needs and is a way to become rich (Blanchflower, 2000). Parker (2004) has described self-employment as workers who earn their income or salary by starting a business at their own risk. Self-employment is often thought of as an option taken by the workers who have low entrepreneurial skills or are misfit in the employment sector. Evans & Leighton, (1990) concludes that self-employment is independent of age and their results are consistent with the fact workers with low salaried jobs enter self-employment. There are several variables evaluated against self-employment. Some studies include education as the main driver of success in the self-employment, (Robinson & Sexton, 1994). Others focus on the fact that self-employment and

paid employment have a difference in earnings. Self-employment may have low initial earnings but gives a chance to be one own boss, (Hamilton, 2000). Blanchflower, (2000) examines the role of self-employment in OECD countries at individual level and concludes with the evidence that self-employment has no significant effect on the economic growth. Yerrabati (2021) analyzes the effects of self-employment on economic growth using two-GMM estimation and it concludes that self-employment has a nonlinear relationship with growth. The study is similar to that conducted by (Carmona et al., 2012) with the difference that the latter research was focused on the relationship between self-employment and business cycle and its results show that the causal relationship between self-employment, unemployment and GDP is bidirectional, and emergence of self-employment can lead to reduced unemployment. Studies conducted under the Schumpeter framework of innovation. Salgado-Banda (2007) use the traditional measure of self-employment for entrepreneurship. However, he also took data of patent applications to analyze productive entrepreneurship. In case of self-employment negative relation is observed with self-employment, growth, education, and financial sector. On the other hand, patent applications give positive and meaningful relationship.

Patents applications are used by the Venture Capitalists (VC) to evaluate the quality of new ventures. (Hsu & Ziedonis, 2008) suggests that patents provide an alternative mechanism to examine the investors approximates of startup quality. They conclude that this signaling quality is beneficial for the startups. Likewise, at the initial stages of a startup, it also helps in reshaping the innovation and technological aspects of a venture. Patents are not only considered to be the protection but also an incentive creator, collaborator, negotiator, tax-planner, etc. Thus, the ideas of patent propensity, appropriation policies, and reasons for patenting are intently interconnected (Nilsen et al., 2018). The entrepreneurial region shows that the firms are active in patenting, the larger firms have more patenting resources and competence than the smaller ones, and Patents are used for customer marketing purposes as they are used in high-tech. (Holgersson, 2013) (Hall et al., 2013). The empirical proof indicates that patents offer a dependable degree of revolutionary activity. The degree of patented innovations gives a reasonable, even though not perfect, illustration of revolutionary activity. This helps using patent counts in research inspecting technological change (Acs et al., 2002). The relationship between patent applications and future changes in the company's performance and the correlation of various indicators of innovation, research and development with patents have already been discussed in different empirical studies. (Archibugi, 1992). The correlation between patents and economic performance has also been studied at firm's level. Some studies have shown a positive correlation between the firm's patents and its competitive position however the methodology used in those researches has some restrictions (Ernst, 2001). The World Bank publications have acknowledged that intellectual

properties have different effects in the different levels of economy. What matters to innovation and growth is not only the strength of intellectual property rights but also the type of protection (Kim et al., 2012). The stage of innovation it involves the technological aspects and the benefits of filing patents at the early stage or right time of the venture. The impact of patent has been positive in the company's future performance, research and development, innovation and economic growth. (Verspagen & Schoenmakers, 2004).

Business and development go inseparably with the other measures of entrepreneurship. Low (2017) connects business venture with advancement, by clarifying that businesspeople use development as an instrument in their work (Drucker 1985: 30). Furthermore, development is about underutilized properties. There are always good and bad ideas floating about, but the key to progress is to put them to good use (Cihangir & Aksöza, 1997). Consolidating these properties, increase their value. (Moore, 1998).

The word innovation originates from Innovare, which makes an interpretation of to come up with new things. (Bessant et al., 2001, p. 66.) (Shane and Venkataraman 2000: 218), in their work The Promise of Entrepreneurship as a Field of Research, clarify business venture as the blend of enterprising freedoms and the presence of venturesome people or business visionaries.

Control Variables for Economic Growth

Several econometric models are constructed to explain economic growth as a function of relevant economic factors. Earlier studies have taken economic openness as a determinant of economic growth. At least three proxies of economic openness used in the previous literature are gross capital formation, Trade to GDP ratio and Foreign direct investment. The effect of economic openness on economic growth is found to be both positive or negative and in some of the studies it is insignificant (Stoica et al., 2020). It is suggested that economic openness can create spillover effects which can positively increase exports of a country and can directly affect economic growth. (Coulibaly et al., 2018)

Financial stability and government fiscal policy have also been taken as the indicators effecting economic growth. In this context, variables like domestic credit to private sector and government expenditure to GDP are taken into account (Hurtado Rendón et al., 2017). The effect of domestic credit is suggested to be positive on economic growth. Financially stable countries tend to allocate their resources efficiently (Aparicio et al., 2016).

The key macroeconomic indicators like inflation and unemployment have also been discussed in earlier literature as the determinants of economic growth.

Unemployment is considered a prime factor which can condense economic growth. On the other hand, inflation can affect the factors of production of an economy and thereby affecting demand and supply. These are commonly discussed determinants of economic growth in the previous literature (Dvouletý, 2018) (Salgado-BANDA, 2007).

The previous literature helps identify at least four variables that may be used as proxies of entrepreneurship. These proxies include new business density, self-employment, research and development, and patent applications. The impact of these variables may vary differently for different countries due to their prevailing macroeconomic conditions. To determine the impact of entrepreneurship using the four proxies separately on economic growth, we need to employ relevant macroeconomic variables or determinants as control variables. For this, the previous literature identifies at least gross capital formation, domestic credit to private sector, inflation, unemployment, foreign direct investments, and globalization as the critical determinants of economic growth.

Research Methodology

We can develop the following models for estimating the impact of entrepreneurship on economic growth. As the aim is to identify the impact separately for different countries, the countries are categorized as high-, middle-, and low-income countries as per the World Bank's classification. With the panel of high-, middle-, and low-income countries the estimation models become

$$\mathbf{GDPC_{it}} = \boldsymbol{\beta_0} + \boldsymbol{\beta_1}\mathbf{BD_{it}} + \sum_{\mathbf{k=1}}^{\mathbf{m}} \boldsymbol{\beta_k}\mathbf{X_{kit}} + \boldsymbol{\epsilon_{1it}} \quad (1)$$

$$\mathbf{GDPC}_{\mathrm{it}} = \boldsymbol{\gamma 0} + \boldsymbol{\gamma_1}\mathbf{PA}_{\mathrm{it}} + \sum_{\mathrm{k=1}}^{\mathrm{m}} \boldsymbol{\gamma}_{\mathrm{k}}\mathrm{X}_{\mathrm{kit}} + \epsilon_{2\mathrm{it}} \quad (2)$$

$$\mathbf{GDPC}_{\mathrm{it}} = \boldsymbol{\alpha_0} + \boldsymbol{\alpha_1}\mathbf{SE}_{\mathrm{it}} + \sum_{\mathrm{k=1}}^{\mathrm{m}} \boldsymbol{\alpha}_{\mathrm{k}}\mathrm{X}_{\mathrm{kit}} + \epsilon_{3\mathrm{it}} \quad (3)$$

$$\mathbf{GDPC}_{\mathrm{it}} = \boldsymbol{\delta_0} + \boldsymbol{\delta_1}\mathbf{RD}_{\mathrm{it}} + \sum_{\mathrm{k=1}}^{\mathrm{m}} \boldsymbol{\delta}_{\mathrm{k}}\mathrm{X}_{\mathrm{kit}} + \epsilon_{4\mathrm{it}} \quad (4)$$

Where GDPC is the per capita GDP, BD shows business density, PA is patent application, SE refers to self-employment, and RD is research and development. X refers to the control variables for economic growth which may include gross capital formation, domestic credit to private sector, inflation, unemployment, foreign direct investments, and globalization as the determinants. The four models may be estimated separately for the panel of high-, middle-, and low-income countries. The estimation can help identify the differences in the impact of entrepreneurship among different types of countries while keeping their macroeconomic conditions into consideration.

Data used in this paper is gathered from the World Development Indicators. The data is sorted by the income level of the countries i.e., High Income Countries, Middle Income Countries, and Low-Income Countries. Hence, it is a panel data of three types of countries. The low-income countries' panel is avoided in estimations due to large number of missing values and data constraint. Initially, four variables, as proxies of entrepreneurship, are taken including Self Employment, Business Density, Patent Applications, and Research and Development (R&D) but R&D is dropped due to large number of missing values.

The dependent variable is GDP per capita (PGDP) as an indicator of economic growth. The independent variables of the estimated models are Entrepreneurship proxy, Gross Capital Formation per capita, Domestic Credit to Private Sector, Inflation, Globalization, and FDI Inflows. Total number of high-Income countries and middle-income countries are 82 and 105 respectively. Due to missing values countries and years are filtered out. The data for self-employment and patent application is mostly available from 2003 to 2019 and for business density from 2006 to 2018. Every country with more than two missing values of any variable during these periods is dropped from the estimation. Finally, the total number of high-income countries' data used in the estimation for the models with SE, BD, and PA are 42, 37, and 31 respectively from the total number of 82 high-income countries. Likewise, the total number of middle-income countries' data used in the estimation for the models with SE, BD, and PA are 55, 37, and 27 respectively from the total number of 105 middle-income countries.

Table 2 below gives the description of independent and dependent variables used and the table gives the expected signs of variables based on previous estimations.

According to previous literature BD is found to have a positive relationship with PGDP whereas SE and PA can have both positive and negative relationship with GDPC. In terms of control variables PGCF, DC, and GLOB are found to have a positive relationship with PGDP. On the other hand, INF and FDI

are found to have both negative and positive relationship with PGDP. Table 2 also presents description of variables used in the analysis.

Table 2: Description and Expected Impact of the Variables Used

Variable abbreviations	Description	Expected Impact
	Dependent Variable	
GDP per capita **(PGDC)**	Per capita gross domestic product	-
	Independent Variables	
New business density **(BD)**	Number of new limited liability corporations registered in the calendar year	Positive
Patent applications per hundred thousand persons **(PA)**	Ratio of patent applications to million population.	Positive / Negative
Self-employment **(SE)**	Number of jobs where the reward is directly dependent upon the profits derived from the goods and services produced	Positive / Negative
	Control Variables	
Gross Capital formation per capita **(PGCF)**	Per capita gross capital formation	Positive
Domestic credit to private sector **(DC)**	Ratio of financial resources provided to the private sector by financial corporations to GDP	Positive
Inflation **(INF)**	Annual growth rate of price change in the economy as a whole, also known as GDP deflator	Positive / Negative
Globalization **(GLOB)**	International trade (Imports and Exports) as per as percentage of GDP.	Positive
Foreign direct investment (inflows) **(FDI)**	Ratio of foreign direct investment (FDI) to GDP	Positive / Negative

Source: Authors' compilation

At first descriptive analysis and correlation analysis for checking multicollinearity are conducted for the variables. As the objective of this paper is to test the relationship of entrepreneurship with economic growth, following equations are estimated separately.

$$\mathbf{PGDP_{it}} = \mathbf{B_0} + \boldsymbol{\beta_1}\mathbf{BD_{it}} + \boldsymbol{\beta_2}\mathbf{PGCF_{it}} + \boldsymbol{\beta_3}\mathbf{DC_{it}} + \mathbf{B_4INF_{it}} + \mathbf{B_5GLOB_{it}} + \mathbf{B_6FDI_{it}} + \boldsymbol{\epsilon_{1it}} \quad (5)$$

$$\mathbf{PGDP_{it}} = \boldsymbol{\gamma 0} + \boldsymbol{\gamma_1 PA_{it}} + \boldsymbol{\gamma_2 PGCF_{it}} + \boldsymbol{\gamma_3 DC_{it}} + \boldsymbol{\gamma_4 INF_{it}} + \boldsymbol{\gamma_5 GLOB_{it}} + \boldsymbol{\gamma_6 FDI_{it}} + \boldsymbol{\epsilon_{2it}} \quad (6)$$

$$\mathbf{PGDP_{it}} = \boldsymbol{\alpha_0} + \boldsymbol{\alpha_1 SE_{it}} + \boldsymbol{\alpha_2 PGCF_{it}} + \boldsymbol{\alpha_3 DC_{it}} + \boldsymbol{\alpha_4 INF_{it}} + \boldsymbol{\alpha_5 GLOB_{it}} + \boldsymbol{\alpha_6 FDI_{it}} + \boldsymbol{\epsilon_{3it}} \quad (7)$$

However, the procedure adopted to estimate the best model among pooled regression model, random effect model, or fixed effect model is as follows. First all models are estimated with pooled regression model. Breusch-Pagan (BP) test is applied to know whether the pooled regression model is best or we need to estimate random or fixed effect. The BP test concludes whether there are two sided (cross-section and time) or one sided (cross-section or time) are existing in the model. Based on the BP test results the model is then estimated for random effect model, which is further tested using Hausman test for the use of random or fixed effect. After the application of Hausman test, it is finalized that which of the three models is best suited in which case.

Results and Discussion

This section covers descriptive analysis of all the variables used in the estimation for high- and middle-income countries. As we have used three proxies for entrepreneurship and number of countries in their respective high- and middle-income countries' panel are different. Therefore, the descriptive analysis is conducted for six panels of high- and middle-income countries with each of the three proxies of entrepreneurship: Business Density (BD), Patent Applications (PA), and Self Employment (SE).

Table 3: Descriptive Analysis for BD panels' data

HIGH INCOME COUNTRIES						
	Mean	**Maximum**	**Minimum**	**Std. Dev.**	**Skewness**	**Kurtosis**
PGDP	36,386.88	102,913.50	5,695.97	20,514.18	0.68	3.04
BD	5.45	32.44	0.04	5.16	2.48	10.69
PGCF	8,872.51	32,990.78	1,197.53	5,865.08	1.34	4.81
DC	97.09	233.21	25.73	45.05	0.53	2.54
INF	2.15	33.75	(25.13)	4.60	(0.21)	19.03
GLOB	1.15	4.43	0.24	0.78	2.39	9.06
FDI	0.06	0.87	(0.40)	0.12	2.56	15.37
MIDDLE INCOME COUNTRIES						
	Mean	**Maximum**	**Minimum**	**Std. Dev.**	**Skewness**	**Kurtosis**
PGDP	4,617.36	15,974.64	294.16	3,241.42	0.83	3.25
BD	2.08	20.09	0.02	2.90	2.38	9.80
PGCF	1,147.01	3,786.39	-	799.33	0.68	2.68
DC	43.59	160.12	2.26	32.76	1.51	5.22
INF	7.04	75.28	(26.10)	8.44	2.70	20.88
GLOB	0.83	2.03	0.00	0.36	0.28	2.44
FDI	0.04	0.44	(0.37)	0.05	1.69	24.39

Source: Author's Estimation

Table 3 provides a summary of descriptive analysis of high- and middle-income countries for the panels of BD proxy. Variation in the number of observations between high- and middle- income countries is due to different number of countries in panels and intra-panel variations are due to missing values. The table shows that the mean values of business density and per capita GDP along with all other independent variables are higher in high-income countries than the middle-income countries except for inflation which is higher in middle-income countries.

Table 4: Descriptive Statistics for PA panels' data

HIGH INCOME COUNTRIES						
	Mean	**Maximum**	**Minimum**	**Std. Dev.**	**Skewness**	**Kurtosis**
PGDP	38,651.60	118,823.60	2,679.41	22,349.11	1.02	4.38
PA	326.38	3,318.62	1.75	625.58	3.35	13.50
PGCF	8,752.80	28,662.04	621.50	5,233.14	0.97	3.91
DC	109.65	308.98	13.33	49.38	0.55	3.18
INF	2.25	23.15	(6.01)	2.57	2.53	16.61
GLOB	1.14	4.43	0.22	0.90	2.14	6.88
FDI	0.09	2.80	(0.58)	0.25	6.55	61.09
MIDDLE INCOME COUNTRIES						
	Mean	**Maximum**	**Minimum**	**Std. Dev.**	**Skewness**	**Kurtosis**
PGDP	4,932.56	15,974.64	429.79	3,345.34	0.80	3.02
PA	34.68	1,000.78	0.14	109.14	6.13	45.81
PGCF	1,189.97	4,438.99	70.84	837.02	0.93	3.63
DC	50.72	164.66	9.68	35.44	1.46	4.31
INF	7.15	45.17	(6.46)	6.26	2.23	10.58
GLOB	0.67	2.10	0.22	0.37	1.68	5.73
FDI	0.03	0.31	(0.00)	0.03	4.03	28.64

Source: Author's Estimation

Table 4 gives a of summary of descriptive analysis of the high- and middle- income countries for the panels of PA proxy. It has similar variations as observed in the BD panels. The patent applications and per capita GDP along with the other variables are higher in high-income countries except for inflation and unemployment.

Table 5 highlights the descriptive statistics of high- and middle- income countries panels for SE proxy of entrepreneurship. The inter and intra panel variations for SE panels are like the BD and PA panels. However, the self-

employment is higher in middle income countries unlike the two other entrepreneurship proxies of BD and PA. Further, per capita GDP and other variables have higher values in high-income countries except for inflation and unemployment.

Table 5: Descriptive Statistics for SE panels' data

HIGH INCOME COUNTRIES						
	Mean	**Maximum**	**Minimum**	**Std. Dev.**	**Skewness**	**Kurtosis**
PGDP	35,931.12	118,823.60	2,679.41	21,889.72	1.08	4.40
SE	15.15	39.54	0.41	7.87	0.71	3.31
PGCF	8,271.93	34,470.06	-	5,660.12	1.40	5.31
DC	97.32	308.98	0.19	48.64	0.79	3.59
INF	2.75	33.75	(25.96)	4.91	0.25	15.10
GLOB	1.14	4.43	-	0.84	2.12	7.11
FDI	0.10	4.49	(0.58)	0.34	7.96	81.17
MIDDLE INCOME COUNTRIES						
	Mean	**Maximum**	**Minimum**	**Std. Dev.**	**Skewness**	**Kurtosis**
PGDP	3,973.16	22,942.58	252.40	3,360.89	1.70	7.07
SE	49.15	91.14	6.62	20.69	0.11	2.11
PGCF	985.12	8,933.74	45.01	930.60	2.69	15.78
DC	39.72	164.66	1.27	31.53	1.62	5.59
INF	6.52	80.75	(26.10)	7.51	2.28	20.26
GLOB	0.78	2.10	0.21	0.35	0.80	3.47
FDI	0.04	0.44	(0.37)	0.05	2.33	23.02

Source: Author's Estimation

Like the descriptive analysis, correlation analysis is also conducted for all six panels of high- and middle- income countries by proxies of entrepreneurship. In the BD panel, it shows that all the correlations between independent variables,

specifically, are low except for the correlations between business density and globalization and foreign direct investment and globalization which are slightly higher than 50%. In the PA panel, correlations between independent variables are low except for the correlation between patent applications and per capita gross capital formation is slightly over 50%. Similarly, in the SE panel, the correlations between independent variables are low and specifically negative with self-employment. Majority of correlations are weak between independent variables in all panels which suggests that the issue of multicollinearity in estimations may not be significant.

Estimations of the models

Estimations of the model for high- and middle-income countries with three variables of entrepreneurship treated separately begin with pooled regression. The pooled regression results suggest that the entrepreneurship has negatively impacted the per capita GDP, keeping the other relevant factors constant. This negative impact is found consistent across the three measures of entrepreneurship including new business density, patent applications per hundred thousand persons, and self-employment.

Table 6: Pooled regression estimation results

Independent variables	Y = BD		Y = PA		Y = SE	
	HIC	MIC	HIC	MIC	HIC	MIC
C	1627.26*	914.31***	1761.78*	332.61*	4506.08***	3461.42***
	(959.29)	(193.55)	(964.36)	(186.66)	(1,438.95)	(185.17)
Y	-233.08***	7.6	-2.31***	-10.54***	-186.39***	-37.24***
	(78.88)	(26.10)	(0.51)	(0.77)	(48.92)	(2.20)
PGCF	3.04***	3.62***	3.93***	4.21***	3.18***	3.03***
	(0.06)	(0.09)	(0.06)	(0.09)	(0.07)	(0.05)
DC	95.48***	8.9***	25.08***	5.77**	61.15***	-2.46*
	(8.25)	(2.28)	(7.24)	(2.36)	(7.48)	(1.42)
INF	-42.76	3.98	-392.19***	21.35**	22.41	12.43**
	(69.43)	(8.05)	(119.57)	(10.33)	(70.15)	(5.49)
GLOB	-407.00	-934.09***	1084.36***	-700.16***	1842.50***	-651.39***

	(533.35)	(211.08)	(360.40)	(219.40)	(428.03)	(129.80)
FDI	4905.09	-2476.27*	1360.9	-531.92	-1933.24*	-3113.85***
	(3,200.85)	(1,374.46)	(1,352.71)	(2,273.81)	(1,054.04)	(906.77)
R-sq	0.90	0.81	0.91	0.85	0.84	0.87
A. R-sq	0.90	0.81	0.91	0.85	0.84	0.87
F-stat.	659.69	321.90	868.13	407.01	600.91	1,002.52
Prob.	0.00	0.00	0.00	0.00	0.00	0.00

Source: Authors' estimations

Among the control variables, the per capita gross capital formation has positive impact on the per capita GDP, domestic credit to private sector has positive impact on the per capita GDP, the inflation is found to have positive impact for middle income countries but negative for high income countries. It is also found insignificant in three models as well. Apart from that globalization has shown positive impact for high income countries but negative for middle income countries. In addition to that, the foreign direct investment has either negative or no impact on per capita GDP. Majority of the estimation results are in line with the a priori information. However, it is important to note that if the pooled regression model is the appropriate model for estimation or not. For this purpose, Breusch-Pagan (BP) test is conducted. Results of the tests are given below.

Table 7: Breusch-Pagan (BP) test results

Entrepreneurship proxy	Income level of country	Cross-section	Time	Both
BD	**HIC**	784.35***	13.70***	798.05***
	MIC	1,343.07***	3.90**	1,346.98***
PA	**HIC**	1,607.88***	0.10	1,607.98***
	MIC	1,344.31***	0.26	1,344.57***
SE	**HIC**	2,044.91***	10.18***	2,055.09***
	MIC	2,546.11***	0.02	2,546.13***

Source: Authors' estimations

The BP tests results indicate that in all the six cases the pooled regression is not an appropriate model, as mentioned in Table 7. We need to estimate these models either through fixed or random effect models. The estimation results suggests that the models for high- and middle-income countries with new business density has two sided cross or random effect and the model for high income country with self-employment has two sided cross or random effect. However, the remaining three models have one sided (cross section) effects.

We regressed all the models with random effect for cross section and the three which had two sided effects are also regressed with random effect model for time as well. After the random effect model estimations, the Hausman test was conducted to check whether fixed or random effect model is more appropriate. The results of Hausman test suggests that the fixed effect model is more appropriate for all the cases except for the middle income with new business density, which shows random effect model is more appropriate for period. Following are the results of Hausman Test for all the six models.

Table 8: Hausman Test Results

		Chi-Sq. Statistic	
Entrepreneurship proxy	**Income level of country**	**Cross Section**	**Period**
BD	**HIC**	55.98***	33.55***
	MIC	24.37***	1.94
PA	**HIC**	33.80***	
	MIC	21.16***	
SE	**HIC**	18.12***	32.30***
	MIC	43.06***	

Source: Authors' estimations

The final estimation results of appropriate panel data models as directed by the Hausman test suggests that the variables of entrepreneurship used in this paper such as business density, patent applications, and self-employment are grossly statistically insignificant except for patent applications in case of middle-income countries panel, which shows negative impact of the variable on per capita GDP. This highlights that entrepreneurship, at least to the extent of the three variables or proxies used in this paper, could not make significant impact on the economic growth. It may be due to the reason that the entrepreneurship activities are too low to produce any meaningful impact on the economic growth.

It may also be due to the reason that proxies of entrepreneurship are unable to capture the impact of entrepreneurship.

Apart from this, other control variables have shown notable impact on per capita GDP. The per capita gross capital formation has indicated statistically significant and positive impact on per capita GDP. In addition to this, the quantum of impact is more pronounced for middle-income countries as compared to high-income countries. It represents the fact that middle-income countries have more potential to translate investment or gross capital formation in economic growth as compared to high-income countries, which have more stable economies and grows gradually through investment.

Table 9: Final Estimation Results

	Y = BD			**Y = PA**		**Y = SE**	
	HIC	**MIC**		**HIC**	**MIC**	**HIC**	**MIC**
	FE	**FE**	**RE**	**FE**	**FE**	**FE**	**FE**
C	28717.98***	2771.14***	914.31***	7767.68***	1050.4***	25399.31***	2453.72***
	2399.01	288.43	195.53	1421.89	219.69	2584.77	488.74
Y	48.78	5.3	7.6	1.51	-6.05***	-55.58	-8.45
	112.63	31.8	26.37	1.55	0.51	116.57	7.97
PGCF	1.86***	2.5***	3.62***	3.05***	3.45***	2.06***	2.45***
	0.10	0.1	0.09	0.07	0.08	0.08	0.05
DC	-21.34**	2.53	8.9***	-16.68**	19.31***	-6.41	17.51***
	10.92	3.55	2.3	8.21	3.87	8.86	2.78
INF	87.28***	4.47	3.98	-261.36***	14.54**	155.27***	5.84
	36.37	4.55	8.13	71.88	6.62	39.44	3.73
GLOB	-6401.29***	-1174.70***	-934.09***	5311.83***	-1088.09***	-4749.82***	-1356.57***
	1400.38	295.3	213.23	943.13	288.11	1193.6	188.37
FDI	2014.66	-4834.23***	-2476.27*	789.48	-11684.97***	-772.47	-4146.66***
	1828.89	777.3	1388.48	828.44	1315.23	638.62	623.58
R-squared	0.98	0.97	0.81	0.98	0.97	0.96	0.96
Adj R-squared	0.98	0.96	0.81	0.98	0.97	0.96	0.96
F-statistic	384.77	281.66	321.9	626.37	420.67	273.39	343.37
Prob(F-statistic)	0	0	0	0	0	0	0

Source: Authors' estimations

FE – Fixed Effect Model, RE – Random Effect Model

Domestic credit to private sector per GDP (DC) has a deviating impact on per capita GDP in the high- and middle-income countries panels. DC has positive impact for middle-income countries but negative impact for high-income countries on per capita GDP. These impacts are in line with the impact of per capita gross capital formation.

Inflation and globalization have somehow mixed effect on per capita GDP. It lacks consistency in middle- and high-income countries panel as well. However, the foreign direct investment has significantly negative impact on per capita GDP in middle-income countries but has no significant impact in case of high-income countries. As per the a priori information, only globalization is inconsistent as it does not have strictly positive impact on per capita GDP.

Conclusions and Recommendations

In an attempt to estimate the impact of entrepreneurship on economic growth with multiple proxies of entrepreneurship and relevant control variables as suggested in the previous literature, this paper has some interesting conclusions.

The data of business density, patent applications, and self-employment, as proxies of entrepreneurship, collected from WDI suggests a significant difference in the entrepreneurial activities between the high- and middle-income countries. The business density and patent application has been significantly higher in the high-income countries as compared to the middle-income countries. However, the self-employment is significantly higher in middle-income countries as compared to high-income countries. Initial calculations show that correlations between entrepreneurship's proxy variables and per capita GDP are moderate to low. Similar pattern is recognized with the other control variables as used in the study. Estimations in this paper are based on the panel data techniques for the six models based on high- and middle-income countries data and the three proxies of entrepreneurship such as business density, patent applications, and self-employment. Initial estimations with pooled regressions indicate negative impact of entrepreneurship on economic growth. However, the post estimation results direct that the best estimation model is fixed effect in most of the cases. Upon estimating the models with the most appropriate technique, the negative impact turned to insignificant impact of the entrepreneurship on economic growth. This shift leads us to conclude that either the entrepreneurship has no significant impact on economic growth or the proxies are unable to cover the very concept of the entrepreneurship. It also indicates that the variations in per capita GDP or economic growth, are more due to the variations in the income level of countries and the control variables such as gross Capital formation per capita, domestic credit to private sector, inflation, globalization, foreign direct investments (inflows). Differences in income and impact of control variables are too significant to wipe out the negative impact of entrepreneurship.

Based on these conclusions, it is recommended to thoroughly analyze the proxies of entrepreneurship and develop a more comprehensive definition and suggest an appropriate indicator. Further, there is a need to identify the reasons behind lower effectiveness of entrepreneurial activities on economic growth on the wider range of countries.

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Appendix

Table 10: Name of the countries whose data is used in the estimation

Sr. No.	Self-Employment (Data from 2003-2019)		Patent Application (Data from 2003-2019)		New Business Density (Data from 2006-2018)	
	HIC	**MIC**	**HIC**	**MIC**	**HIC**	**MIC**
1	Australia	Algeria	Australia	Algeria	Australia	Algeria
2	Austria	Argentina	Austria	Argentina	Austria	Bhutan
3	Barbados	Bangladesh	Belgium	Bangladesh	Belgium	Cambodia
4	Belgium	Belize	Chile	Brazil	Chile	Costa Rica
5	Chile	Bhutan	Croatia	Bulgaria	Croatia	Gabon
6	Croatia	Bolivia	Cyprus	China	Cyprus	Guatemala
7	Cyprus	Botswana	Czech Republic	Colombia	Czech Republic	India
8	Czech Republic	Brazil	Denmark	Costa Rica	Denmark	Jamaica
9	Denmark	Bulgaria	Estonia	Dominican Republic	Estonia	Jordon
10	Estonia	Cambodia	Finland	Ecuador	Finland	Malaysia
11	Finland	Cameroon	France	Egypt	France	Mexico
12	France	China	Germany	Guatemala	Germany	Mongolia
13	Germany	Colombia	Greece	India	Hongkong	Nepal
14	Greece	Comoros	Hongkong	Iran	Hungry	Nigeria
15	Hongkong	Congo Rep	Hungry	Jamaica	Iceland	Pakistan
16	Hungry	Costa Rica	Iceland	Jordon	Ireland	Peru
17	Iceland	Cote D Ivoire	Israel	Kenya	Israel	Philippines
18	Ireland	Dominican Republic	Japan	Malaysia	Italy	Russian Federation
19	Israel	Ecuador	Korea Rep	Mexico	Japan	Senegal
20	Italy	Egypt	Luxembourg	Pakistan	Malta	Argentina
21	Japan	El Salvador	Netherlands	Peru	Mauritius	Belarus
22	Korea Rep	Equatorial Guinea	Norway	Philippines	Netherlands	Belize
23	Kuwait	Eswatini	Poland	Russian Federation	Norway	Lesotho
24	Luxembourg	Fiji	Portugal	South Africa	Oman	Montenegro
25	Macao Sar China	Gabon	Romania	Sri Lanka	Poland	Serbia
26	Malta	Ghana	Singapore	Tunisia	Portugal	Sri Lanka
27	Mauritius	Guatemala	Spain	Vietnam	Qatar	Tanzania

28	Netherlands	Honduras	Sweden	Romania	Thailand
29	Norway	India	Switzerland	Saudi Arabia	Tunisia
30	Oman	Iraq	UK	Singapore	Botswana
31	Poland	Jamaica	USA	Slovak	Bulgaria
32	Portugal	Jordon		Slovenia	Georgia
33	Qatar	Kenya		Spain	Iraq
34	Romania	Kyrgyz Republic		Sweden	Kyrgyz republic
35	Saudi Arabia	Lebanon		UK	Myanmar
36	Singapore	Malaysia		Korea Rep	South Africa
37	Slovenia	Mauritania		Switzerland	Ukraine
38	Spain	Mexico			
39	Sweden	Mongolia			
40	UK	Nepal			
41	Uruguay	Nicaragua			
42	USA	Nigeria			
43		Pakistan			
44		Paraguay			
45		Peru			
46		Philippines			
47		Russian Federation			
48		Senegal			
49		South Africa			
50		Sri Lanka			
51		Tanzania			
52		Timor-Leste			
53		Tunisia			
54		Vietnam			
55		West Bank and Gaza			

Source: Authors' compilation

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