

An Empirical Evidence on Entrepreneurship and Economic Growth in India

Atul R. Deshpande*

Abstract

This research paper examines the empirical correlation and causality between economic growth as dependent and entrepreneurship as independent variables. To investigate such correlation and causality, gross domestic product at factor cost is used to examine growth and 'patents applications' (PAT) and 'self-employment' (SELF) are used as proxies for entrepreneurship. The initial TSLS (Two-stage Least Square) results showing correlation and causality between growth and entrepreneurship through PAT and SELF are not very robust and statistically significant. Notwithstanding, the TSLS results showing a correlation and causality between PAT on the LHS and a few instrumental variables on the RHS of the second equation have shown a more meaningful and robust results. Further, predictors and residuals as independent variables on PAT and SELF and growth as a dependent variable have meaningfully confirmed the earlier TSLS results showing a significant correlation between PAT and SELF as dependent variables and IVs as independent variables in the RHS of the equation. More robust and significant causality is found when the square of predictors of IVs along with the predictors of PAT and SELF are regressed on economic growth.

Keyword: Two-Stage Least Square, Patents, Self-employment, Economic Growth, Predictors, Residuals

Introduction

This research paper examines a correlation between economic growth and entrepreneurship. To understand this correlation between the two variables has been a

complicated process and it requires many non-scaling instrumental variables in addition to scaling latent independent variables. This is primarily because of the nature of 'entrepreneurship' (which is primarily a non-measurable phenomenon) and a dynamic process through which many factors (endogenous and exogenous both) explain the nature of entrepreneurship. This paper, therefore, is divided into three parts. The first part includes objectives of research, a theoretical construct, the model employed and methodology used in this research paper along with the hypotheses. The second part analyzes the results of the research along with an examination of empirical evidence. The third part proposes a few recommendations and it also concludes this research paper with implications and limitations of this empirical research.

Review of Literature

It has been observed that one of the most interesting and challenging issues economists and social scientists face is the relationship between economic growth and entrepreneurship. Notwithstanding, empirical studies have not been able to find strong statistical evidence for this relationship. The reason behind this is the problem of measurement of entrepreneurial activity through a well-defined and acceptable proxy for entrepreneurship. In this connection, therefore, the three issues have been put forth. They are: 1) How can we measure entrepreneurship? 2) What factors help to determine it? 3) What is the relationship between different measures of entrepreneurship and economic growth?

* Associate Professor, Smt. Hiraben Nanavati Institute of Management & Research, Pune, Maharashtra, India.
E-mail: atdash10@yahoo.com

The following studies have tried to examine whether any one variable explains the nature of entrepreneurship and measures its impact on economic growth. For example, Barro (1991) and Barro & Lee (1993) have studied human capital, Edwards (1998) and Harrison (1996) have focused on openness, King & Levine (1993a, b) and Levine *et al.* (2000) have examined financial activity, and Sarel (1996) has looked at inflation. Hector Salgado Banda's study (2005) has used 'patent rights' as proxy for entrepreneurship and 'self-employment' as an alternative proxy for entrepreneurship. His study has used a cross-sectional analysis for the period 1980-1995. More specifically, in his study, cross-section regressions by Ordinary Least Squares (OLS), Two-Stage Least Squares (TSLS) and Generalized Method of Moments (GMM) models are estimated. His study has interpreted the meaning of entrepreneurship based on Joseph Schumpeter (1934) and William J. Baumol's (2002) illustrations on the idea of entrepreneurship.

Theoretical Construct

In this research paper we have used the interpretation of the meaning of the term 'entrepreneurship' as has been discussed by Joseph Schumpeter and William J. Baumol.

Joseph A. Schumpeter

According to Schumpeter, entrepreneurship strikes when there is 'innovation' in the introduction of a new product, organisation or process. In Schumpeter's writings...

"And what have they done: they have not accumulated any kind of goods; they have created no original means of production, but have employed existing means of production differently, more appropriately, more advantageously. They have carried out new combinations! They are the entrepreneurs. And their profit, the surplus to which no liability corresponds, is the entrepreneurial profit". Schumpeter (1934, p.132)

The above extracts clearly show that someone who establishes a new business by replicating existing firms is not an entrepreneur in a Schumpeterian sense. Also, Schumpeter has introduced the notion of creative destruction stating that it represents the main source of economic growth.

William J. Baumol

While noting the correct role of productive and unproductive entrepreneurship, Baumol argues:

"While the total supply of entrepreneurs varies among societies, the productive contribution of the society's entrepreneurial activities varies much more because of their allocation between productive activities such as innovation and largely unproductive activities such as rent-seeking or organized crime". Baumol (1990, p.893)

According to Baumol, productive entrepreneurship is encouraged,

"By incentives for entrepreneurs to devote themselves to productive innovation rather than to innovative rent-seeking (the non-productive pursuit of economic profit such as occurs in inter-business lawsuits), or even to destructive occupations, such as criminal activities". Baumol (2002, p.5)

From the above discussion, it is clear that to Baumol entrepreneurship relates to innovation and entrepreneur is an innovator. More specifically,

It should be observed that entrepreneurship has been studied from various angles. For example, Bewley (1989) has analyzed the role of uncertainty aversion in entrepreneurship. Evans and Jovanovic (1989), Holtz-Eakin *et al.* (1994) and Quadrini (2000) have analyzed the effects of liquidity constraints and savings on entrepreneurship. Gordon (1998) has studied the issue of the impact of tax policy on entrepreneurial activity in the US. Lucas (1978) has stressed the role of capital and entrepreneurial aptitudes as the major factors that determine the division between entrepreneurs and workers. There are many more such studies which have highlighted specific individual factors related to entrepreneurship which have tried to establish a correlation between economic growth and entrepreneurship.

Most of these studies have one commonly drawn inference. There are exogenous and endogenous explanatory variables which affect entrepreneurship and further entrepreneurship has significant correlation with economic growth. To establish any causality between economic growth and entrepreneurship, the problem of measure-

ment of the impact of entrepreneurship on growth is an obvious limitation that many studies have highlighted before.

Objectives of Research

1. The first objective is to examine empirically whether there is any correlation between economic growth and entrepreneurship.
2. The second objective is to confirm whether 'patent rights' (PAT) or 'self-employment' (SELF) used as proxies for entrepreneurship provide best fit for the regression to be estimated between economic growth and entrepreneurship.
3. The third objective is to check whether a Two-Stage Least Square Model gives better estimates on the proposed relationship between economic growth and entrepreneurship upon introducing 'instrumental variables' (IVs) as non-scaling independent variables correlated with PAT and SELF.

Research Methodology

Procedure

This research paper is empirical in nature. The Two-Stage Least Square (TSLS) Model is used to estimate the relationship between economic growth and entrepreneurship. To estimate this relationship, the time series data used span from 1995 to 2013. It has been found that the variables such as self-employment do not have time series data in absolute values. We, have, therefore, used percentile values on all the variables appearing in our equations. To some extent, this may have reduced the robustness of the regression results of our variables. To estimate the relationship between economic growth and entrepreneurship, economic growth is examined through data on gross domestic product at factor cost. To measure entrepreneurship, we have used 'patents' applications' (PAT) as a proxy for entrepreneurship. We have also used an alternative proxy as 'self-employment' for entrepreneurship. The rationale behind the selection of these two proxies has been our theoretical framework where we have understood entrepreneurship as innovative effort and something influenced by Baumol's environmental factors. In addition to our explanatory variables, we have used instrumental variables such as 'trade balance' (TR), 'government size' (GS) expressed

through government's total assets and liabilities, 'inflation' (INF) and 'gross capital formation' (GCF). It has been assumed for estimation purpose that these instrumental variables have direct and/or indirect bearing upon PAT and SELF. For example, a positive trade balance should encourage domestic industry becoming more optimistic and therefore can make more efforts towards innovation. As against this, inflation may produce a negative impact on industry becoming pessimistic owing to high costs due to cost-push inflation. This may discourage production activity and, further, innovative efforts. Increasing rate of gross capital formation is an encouraging variable so far as production activity, through patents and innovation, is concerned. Our instrumental variables may also help out original 2-stage least square results turning out to be more robust and, therefore, meaningful. The 2-stage regression results are carried out in three phases. Initially, a 2-stage least square regression is run between endogenous and exogenous variables along with instrumental variables. In the second phase, exogenous variables appear as dependent variables and instrumental variables appear as independent variables. In the last phase, the predictors and square of predictors from the estimates of PAT and SELF are regressed on the original endogenous variable, i.e. economic growth.

The Model

From the procedure explained earlier, it is clear that the Structural Equation Model is employed to estimate the relationship. There are primarily the three equations simultaneously solved for dependent and independent variables along with predictors. Our model looks as follows:

$$GR = a_0 + b_1 PAT + c_1 SELF + e_1 \quad (i)$$

where GR = Economic growth rate,

PAT = Patent rights,

SELF = Self-employment,

a_0 , b_1 and c_1 are parametric constants and $\neq 0$. e_1 is the error term.

$$PAT = a_0 + a_1 TR + b_1 GS + c_1 INF + d_1 GCF + e_2 \quad (ii)$$

where PAT = Patent rights (The number of applications filled for patent rights),

TR = Trade balance,

GS = Government size (Total assets and or total liabilities),

INF = Inflation (As is measured by the WPI),

GCF = Gross capital formation,

a_0, a_1, b_1, c_1, d_1 are parametric constants to be estimated.
 e_2 is the error term.

$$\text{SELF} = a_0 + a_1 \text{TR} + b_1 \text{GS} + c_1 \text{INF} + d_1 \text{GCF} + e_3 \quad (\text{iii})$$

SELF = Self-employment

To estimate the coefficients, all the three equations have been simultaneously solved with their reduced form. Our results and estimates appear in Part II.

Hypothesis and Testing

We intend to investigate the three possible hypotheses. They are as follows:

H_{10} = Economic growth and entrepreneurship are not highly correlated. Or, economic growth may not be best explained through entrepreneurship.

H_{11} = Economic growth and entrepreneurship are highly correlated. Or, economic growth may be best explained through entrepreneurship.

H_{20} = PAT is not a better measure of entrepreneurship. Or, PAT does not explain changes in entrepreneurship more significantly.

H_{21} = PAT is a better measure of entrepreneurship. Or, PAT explains significant changes in entrepreneurship.

H_{30} = SELF is not a better measure of entrepreneurship. Or, SELF does not explain changes in entrepreneurship more significantly.

H_{31} = SELF is a better measure of entrepreneurship. Or, SELF explains significant changes in entrepreneurship.

Testing

To test our hypotheses we have considered our last regression which has taken into consideration dependent and independent variables along with the predictors on instrumental variables and the square of predictors. Our

regression gives much more robust results when these results are compared with the results of our original TSLS regression results. Our hypotheses testing results are as follows:

- For hypotheses H_{10} and H_{11} , our calculated value of 't' statistic (combined on 6 variables) = 4.75 exceeds the tabular value of 't' = 2.179 for the 5 percent level of significance with 12 d.f., we reject the null hypothesis (H_{10}) that economic growth and entrepreneurship are not highly correlated. This also implies that we can comfortably accept the alternative hypothesis.
- For hypotheses H_{20} and H_{21} , and H_{30} and H_{31} our calculated value of 't' statistic (combined on 2 variables) = 2.174 exceeds the tabular value of 't' = 2.120 for the 5 per cent level of significance with 16 d.f., we reject the null hypotheses (H_{20} and H_{30}) that PAT and SELF are not better measures of entrepreneurship. This implies that the alternative hypothesis which states that that they are better measures of entrepreneurship has been accepted.

Our last regression outputs show that PAT and SELF are positively correlated with growth. This result shows a much improved and opposite inference when compared with our original TSLS results. Our regression results look as shown in Tables 1 and 2.

Table 1: Model Summary on GR and Instrumental Variables

Multiple R	.826
R Square	.681
Adjusted R2	.508
Std. Error of the Estimate	2.29220
F statistics of the model	3.922
Durbin Watson	2.459

(SPSS Outputs on TSLS regression when predictors and square of predictors are introduced)

From the outputs shown in Tables 1 and 2, it can be easily inferred that both the PAT and SELF are positively correlated with growth with beta coefficients = .266 and .464. This shows that 26.6 percent variation in economic growth may be explained by the success of patent application used as proxy for entrepreneurship. As against this, 46.4 percent variation in economic growth may be explained through a drive towards self-employment. This result is a much improved version when compared with

Table 2: Coefficients on GR and Instrumental Variables

Model	Unstandardized Coefficients B ST.ER		Standardized Coefficients Beta	t	Sig.
1 Constant	-863.855	341.757		-2.528	.028
PAT	.266	.213	.326	1.251	.237
SELF	.464	.503	.520	.923	.376
PRE_1	-.044	.004	-.187	-.874	.401
PRE_2	.010	.010	.250	.975	.350
PRE_3	.778	.314	.597	2.479	.031
PRE_4	.003	.010	.178	.297	.772

(Dependent variable GR)

our original TSLS results. This also shows that a relative better measure of growth is self-employment rather than PAT when used as proxies for entrepreneurship.

Empirical Results and Analysis

In this part, we intend to discuss our empirical results and analyze them in the context of our hypotheses. Our first equation related to the TSLS estimates is given below.

$$GR = a_0 - b_1 PAT - c_1 SELF + e_1 \quad (i)$$

$$GR = 23.963 - .879PAT - .160SELF + 4.024$$

$$(1.552) \quad (-1.875) \quad (-.395)$$

Table 3: Model Summary on GR/PAT and SELF

Multiple R	.516
R Square	.266
Adjusted R ²	.168
Std. Error of the Estimate	4.024
F statistics of the model	2.718 at .098 Sig.

(SPSS Outputs on 2SLS)

Table 4: Anova Outputs on GR/PAT and SELF

	B	Std.Error	Beta	t	Sig.
Constant	23.963	15.439		1.552	.141
PAT	-.879	.469	-1.075	-1.875	.089
SELF	-.160	.404	-.179	-.395	.698

(SPSS Outputs on 2SLS)

Table 5: Coefficient of Correlation between PAT and SELF

	PAT	SELF
Correlations PAT	1.000	.722
SELF	.722	1.000

(SPSS Outputs on 2SLS)

From Table 3 it may be inferred that there does exist a correlation between economic growth and entrepreneurship. Nonetheless, the correlation is not very significant. The causality through the initial TSLS regression is also weak. Since the standard error of the estimate is high and the F statistic is relatively low (though not totally insignificant), we may conclude that the initial results (phase 1) are not very robust and the data fit is weak.

The PAT and SELF show a negative correlation but the coefficients are low. Initially, one may argue stating that the patenting and self-employment efforts may discourage an entrepreneurial activity. Or, it may also emphasize that there might be some other variables (essentially non-scaling) whose impact on PAT and SELF might produce different results. This has been supported by the regression and residual outputs (88.049, 242.938), where since the residuals are high as compared to regression outputs, the second phase enquiry into this relation is to be sought for. One may also state that the mean square of regression is high (44.025) as compared to the mean square of residuals (16.196). The lower value of adjusted R² (.168) reemphasizes the fact that there might be such latent variables as may be affecting differently the PAT and SELF predictors. This, further, demands an enquiry into this relation based on the impact through the

residuals or other predictors. It is, therefore, necessary to examine the correlation and causality by introducing other instrumental variables. We shall, therefore, look at our empirical results on the second equation.

$$PAT = a_0 - a_1 TR - b_1 GS + c_1 INF - d_1 GCF + e_2 \quad (ii)$$

$$PAT = 15.757 - .023 TR - .341 GS + .035 INF - .353 GCF + 2.012$$

$$(1.878) \quad (-.796) \quad (-1.030) \quad (.884) \quad (-2.318)$$

Table 6: Model Summary on PAT and Instrumental Variables

Multiple R	.753
R Square	.568
Adjusted R ²	.435
Std. Error of the Estimate	2.012
F statistics of the model	4.268 Sig. .020

(SPSS Outputs on second phase of 2SLS)

From the above estimated coefficients we may infer that the correlation between PAT and the four instrumental variables shows a much better and improved fit as compared to the earlier results. The variables such as TR, GS and GCF have a negative correlation with PAT. Since a majority number of variables show a negative correlation with PAT, the earlier result showing a negative correlation between PAT and GR has been further confirmed. Since their coefficients are not the same, we can argue that their impact on PAT will not produce the results of the same intensity. The negative correlation shows a discouraging influence of these instrumental variables on PAT. But, looking at small values of coefficients, the intensity of

impact is understood to be low. As against this, inflation shows a positive correlation with PAT. This implies that it produces a promoting result so far as their correlation with PAT is concerned. The rationale behind this kind of positive relationship means that a price rise acts as an incentive for business owners to apply for more number of patents and this might as well have a positive effect on entrepreneurship. Nonetheless, the coefficients are small and not very significant. Also, a negative trade balance will discourage research and development activity meant for the growth of patenting. Increase in government size either through increase in government assets or liabilities shall come at the cost of a reduction in the private size of the activity. This might produce a negative effect on patents and through it on entrepreneurship. If more and more of gross capital formation goes as investment into manufacturing or service activity and less of it is available for infrastructure development or private R&D, patenting activity will be discouraged.

These results show a better fit because the R and R² values have improved and the ‘F’ statistic shows a much better level along with reduced standard error of the estimate. Based on the collinearity statistics, it can be inferred that there does not exist multicollinearity among instrumental variables. This is because the values are less than 2.5 (if it is a weaker model) and/ or not exceeding 10 (if it is a better- fit model).

$$SELF = a_0 + a_1 TR - b_1 GS + c_1 INF + d_1 GCF + e_3 \quad (iii)$$

$$SELF = 11.873 + .005 TR - .088GS + .025INF + .635GCF + 1.24744$$

$$(3.407) \quad (.449) \quad (-.638) \quad (1.557) \quad (10.047)$$

Table 7: Coefficients on PAT and Instrumental Variables

Model						Collinearity Statistics	
	B	Std. Error	Beta	t	Sig.	Tolerance	VIF
Constant	15.757	8.390		1.878	.083		
TR	-.023	.029	-.177	-.796	-.796	.670	1.493
GS	-.341	.331	-.272	-1.030	-1.030	.479	2.090
INF	.035	.039	.204	.884	.884	.624	1.602
GCF	-.353	.152	-.490	-2.318	-2.318	.745	1.343

(SPSS Outputs on second phase of 2SLS)

Table 8: Model Summary on SELF and Instrumental Variables

Multiple R	.955
R Square	.911
Adjusted R ²	.844
Std. Error of the Estimate	1.24744
F statistics of the model	33.360 Sig. .000
Durbin Watson	2.699

(SPSS Outputs second phase of 2SLS)

From the above results it may be inferred that this is the best fit of all the previous fits. Out of the four instrumental variables, the three show a positive correlation with SELF. Only one variable i.e. GS is negatively correlated. This gives us a better room to argue that in a process of a reduced form of equation, the correlation SELF would have with entrepreneurship might turn out to be positive. This has been treated as the best fit because the R and R² values are very high along with a high ‘F’ value. This not only shows that the SELF and the four other instrumental variables are highly correlated, but it also emphasizes that the coefficient of determination value is also very high leading to a good level of causality. The high value of adjusted R² signifies that, at this level of reduction, many other residuals are well taken care of. Since the ‘F’ statistic is very high, the fitness of this model is well established and a Durbin Watson statistics exceeding level 2 implies that the multicollinearity is absent. From the beta coefficients on all the four variables, it is noticed that GCF is highly correlated with SELF. When the gross capital formation is high and ever increasing one, it is a good sign to assume that self-employment will be encouraged. The rest two i.e. TR and INF are also correlated positively

with SELF but the values on coefficients of correlation are relatively small. If the trade balance is positive with exports and increasing domestic trade activity, it appears to be a promoting variable for SELF. Also, a positive rise in prices may also act as an incentive for business owners to invest optimistically with given constant factors. Our beta coefficient on GS shows a negative sign albeit with a small value because of the fact that if the government size increases over the private size of business, the efforts of self-employment may be discouraged.

A comparison made between the impact of our four instrumental variables on PAT and their impact on SELF, the three variables (TR, INF and GCF) have positive impact on SELF whereas the same variables (except INF) show a negative impact on PAT. This also confirms our phase 1 TSLS results that PAT is negatively correlated with entrepreneurship. In the second phase of our TSLS regression, the results on a correlation between the SELF and four other variables (with three variables having positive impact) may encourage us to assume that the SELF will eventually turn out to be a positively correlated factor with entrepreneurship. Now, we shall turn to our last phase of results. In this phase, the predictors saved earlier on PAT and SELF are regressed on our original endogenous variable i.e. economic growth. The initial equation explains the impact of predictors of PAT on growth. The equation is as follows:

$$GR = a_0 + a_1 FIT_1TR - a_2 FIT_2 GS - a_3 FIT_3 INF - a_4 FIT_4 GCF + e_4 \text{ (iv)}$$

$$GR = 17.167 + .435TR - .236GS - .814INF - .255GCF + 2.28724$$

$$(5.032) \quad (.829) \quad (-.760) \quad (-2.642) \quad (-1.347)$$

Table 9: Coefficients on SELF and Instrumental Variables

Model							Collinearity Statistics
	B	Std. Error	Beta	t	Sig.	Tolerance	VIF
Constant	11.873	3.485		3.407	.005		
TR	.005	.012	.045	.449	.661	.670	1.493
GS	-.088	.138	-.076	-.638	.534	.479	2.090
INF	.025	.016	.163	10.047	.143	.624	1.602
GCF	.635	.063	.962		.000	.745	1.343

(SPSS Outputs on second phase of 2SLS)

Table 10: Model Summary on GR and Predictors of Instrumental Variables

Multiple R	.809
R Square	.654
Adjusted R ²	.510
Std. Error of the Estimate	2.28724
F statistics of the model	4.537 Sig. .015
Durbin Watson	2.151

(SPSS Outputs on third phase of 2SLS with predictors)

If we compare these results with the original TSLS results where PAT and SELF appear as independent variables and where they appear as dependent variables in the second phase with the four instrumental variables, the results are much more robust and significant. With an improvement in multiple R, R² and adjusted R², the standard error of the estimate has declined and the ‘F’ statistic has improved with a much more significant level. The Durbin-Watson statistic shows that the model fits the data. Even with the predictors, the B coefficients have improved and the negative correlation between PAT and TR turns out to be positive when TR predictor is regressed on growth. In spite of all these improvements, we can reconfirm our earlier results showing a negative correlation between PAT and entrepreneurship. And the causality between the two is not very strong. It should be remembered that out of the four predictors of PAT, the three carry a negative sign. Nonetheless, the R and R² have high values implying significant correlation between the four IVs and the PAT. We shall, now, turn to the regression between the predictors of self-employment and growth. In this connection, our equation is as follows:

$$GR = - a_0 - a_1 FIT_1TR + a_2 FIT_2 GS + a_3 FIT_3 INF + a_4 FIT_4 GCF + e_5 (v)$$

$$GR = - 1571.314 - .348FIT_1TR +.387FIT_2GS + 47.410FIT_3INF +.476FIT_4GCF +2.33604$$

$$(-2.353) \quad (-1.217) \quad (.592) \quad (2.302) \\ (2.090)$$

Table 12: Model Summary GR and Predictors of ‘SELF’

Multiple R	.799
R Square	.639
Adjusted R ²	.489
Std. Error of the Estimate	2.33604
F statistic of the model	4.250 Sig. .019
Durbin Watson	2.405

(SPSS Outputs on third phase of 2SLS with predictors on SELF)

These results are quite comparable with the results when the predictors of PAT are regressed on growth. For example, the values on R, R² from the SELF, while regressed on growth, are quite close to the ones when the predictors of PAT are regressed on growth. What is more important with this result is that out of the four instrumental variables, the three show a positive correlation with growth with reasonably a good level of beta coefficients and ‘t’ statistic when compared with the earlier results with PAT where the three variables show a negative correlation. So, these results confirm our original results with 2SLS when the results on the correlation between SELF and the other four instrumental variables are concerned. Only one notable difference is that this result shows TR carrying a negative sign (when regressed with instrumental variables, it showed a positive sign) and GS carries a positive sign

Table 11: Coefficients on GR and Predictors of ‘PAT’

Model	Unstandardized Coefficients B	Standardized Coefficients Std.Error	t	Sig.
Constant	17.167	3.411		.000
Fit_1	.435	.525	.176	.423
Fit_2	-.236	.310	-.194	.462
Fit_3	-.814	.308	-.759	.021
ERR_3	-.255	.189	-.304	.203
ERR_4	.519	.179	.560	.013

(SPSS Outputs on third phase with predictors on PAT)

Table 13: Coefficients on Growth and Predictors of 'SELF'

Model	Unstandardized Coefficients		Standardized Coefficients 't'		Sig.	Collinearity Statistics	
	B	Std. Error	Beta	t		Tolerance	VIF
1 Constant	-1571.314	.286		-2.353	.036		
Fit_1	-.348	.653	-.260	-1.217	.247	.660	1.516
Fit_2	.387	20.593	.151	.592	.565	.464	2.155
Fit_3	47.410	.228	.550	2.302	.040	.526	1.900
Fit_4	.476	.519	.446	2.090	.059	.659	1.518
ERR_4	520.		.221	1.001	.336	.620	1.613

(SPSS Outputs on third phase with predictors on SELF)

which was carrying a negative sign earlier. These results are not astonishing since predictors are introduced in the regression equation.

In both these results if we look at the adjusted R^2 , we may find that their values are close to .50 with a scenario of significant residuals remaining unexplained. This poses a question of correct identification of instrumental variables. To check whether we have 'over identification problem', we have employed 'over identification testing.

Over-identification Testing

To carry out this test, we have performed a regression of the IV residuals (ERR_1 etc.) against all the four instrumental variables. From this regression we have found our R^2 equal to .495. We have multiplied the R^2 by the size of the sample and have found out test statistic equal to 8.91. At 1% level of significance, the critical value for a Chi-square with d.f. =2 (4 instrumental variables – 2 RHS variables) is 9.925 which exceeds our test statistic equal to 8.91. Based on this, we conclude that there is no model specification problem or the instruments chosen are valid. But, at 5% level of significance, the critical value for a Chi-square with d.f. equal to 2 is 4.302. Here, we can note that the test statistic far exceeds the critical value. This suggests that there is a model specification problem and the four instruments we have chosen are invalid. To overcome this problem, we have performed RESET or (Specification Error Test). We shall, now, turn to this test.

RESET (Error Specification Test)

We have initially taken into account the R_0^2 from our original regression. We have saved the predictors from

the results of this regression. Then we have re-run the regression using power functions of the predicted values to test them individually. We have then obtained an R_n^2 , the new multiple regressions R^2 . This has been followed by the application of an 'F' test with the following formula:

$$F = \frac{(R_n^2 - R_0^2) / [(1 - R_n^2) / (n - p)]}{}$$

where 'n' is a sample size and 'p' is the number of parameters in the new model. Our R^2 values from our regression are:

$$R_n^2 = .681$$

$$R_0^2 = .266$$

$$F = (.681 - .266) / [(1 - .681) / (18 - 6)] = 0.108$$

Looking at the 'F' statistic, we can conclude that this is highly insignificant. This further implies that there are no variables omitted and the functional form can be trusted. If we combine the results of the previous test with the results of this test, we may argue that problem with the model (based on our original 2SLS regression) may relate to inadequacy of the number of instrumental variables.

Limitations of Research

1. This research lacks a much more robust time-series which shows absolute values on variables chosen. For example, a time-series data with absolute values on entrepreneurship has not been available. Owing to this problem, a time-series data used appears in the form of percentiles.

2. A cross-sectional study with the use of panel data involving more than one country might produce much better results.
3. If one is intended to go into a rigorous measurement problem of entrepreneurship, one would require a GMM (Generalized Method of Moments) estimator which does not require information about the exact distribution of the disturbances. This also takes care of unknown form of heteroscedasticity. This paper has not used the same.

Implications

1. While understanding the impact of entrepreneurship on growth, a correct conceptualisation of this notion is a prerequisite.
2. Innovative efforts conducive to entrepreneurship require all-sided development of societal efforts which are essentially institutional and legislative in nature.
3. A perfect blend of business related, social and anthropological drive towards entrepreneurship is a dire necessity to understand entrepreneurship in its holistic and more dynamic compulsions with which it affects the entire economic growth process.
4. In India, the entrepreneurial drive requires a much more committed process that demands structural changes in the existing nature of technology, laws and political system which stands primarily on 'corruption incentives' and deep-rooted social process and practices which are not very helpful for the growth of entrepreneurship.

Conclusions

1. In our first conclusion we would like to state that the Schumpeterian framework explaining entrepreneurship in terms of 'innovations' or 'destructive creations' carries a lot of significance. Nonetheless, to estimate the impact of innovations, a much wider range of instrumental variables is required to correctly estimate the impact of innovations on growth.
2. In our study the 'PAT' and 'SELF' have turned out to be satisfactory proxies for entrepreneurship. Nonetheless, we would like to conclude that 'self-employment' is a much better proxy in terms of its correlation with entrepreneurship than the PAT.

3. We would like to finally conclude that 'entrepreneurial innovation' and its impact on 'economic growth' has been a more complex process which would require comprehensive measures of evaluation which are quantitative and qualitative in nature.

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