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Analysis of the Relationship between Entrepreneurship Sources of Finance and Product Innovation

Collins Ngwakwe[1], Mamoloko Rachidi[2], Joseph Musandiwa[3], Sipho K. Mokoena[4]

Abstract: This paper presents an empirical analysis of the relationship between entrepreneurial accesses to finance and product innovation. The objective of this paper is to explore which of the sources of entrepreneurial financing catalyse product innovation. The paper inclines on the prior work of schumpeter's growth and innovation theory. The Logit regression statistics model was applied in the analysis of data and eight different sources of entrepreneurial finance (family finance, friends' finance, own capital, employer's finance, bank finance, government finance, venture capital and crowd funding) were examined independently to ascertain how each source affects product innovation. Data were collected from the Global Entrepreneurship Development Institute's Index of global entrepreneurship. Findings from the analysis show that, crowd funding and venture capital sources are significantly and positively related to growth in entrepreneurship product innovation. Whilst the other variables did not prove to be significantly related, it is noted that bank finance and family finance sources showed a negative relationship with entrepreneurship product innovation. Although not significant at 5% significant level, the employer source of finance showed appreciable positive relationship with a p value of 0.09. Entrepreneurs and policy makers are made aware of the finance sources that may incubate entrepreneurial innovation. Recommendation is provided to improve government policy on entrepreneurship and to assist entrepreneurial product innovation financing strategy. It also offers an agenda for further academic debate and research. One of the few papers to examined up to eight sources of entrepreneurship financing independently on product innovation, and the first paper that uses data from global entrepreneurs from 39 countries.

Keywords: entrepreneurship; product innovation; entrepreneurship finance; start-ups; minority entrepreneurs

JEL Classification: M13; M2; M11

1. Introduction

This paper examines the relationship between entrepreneurial finance access and innovation capability, which is deemed pertinent as finance availability begets innovation (Shi, Gong & Chen, 2019). It becomes necessary thus for entrepreneurs to understand the type of financing that may enhance entrepreneurial innovation. Globally, entrepreneurs in small medium and micro-sized enterprises (SMMEs) make up to 90% of all businesses and constitute more than 50% of job creation and worldwide gross domestic product (GDP). These entrepreneurs also represent at least 70% of the global product innovation and production. Therefore, their contribution to the economy and continued growth cannot be emphasised enough. However, for continued contribution to the economy these entrepreneurial ventures need to remain sustainable. One of the ways in which they can remain sustainable is through continued innovation. "Innovation is a key determinant of productivity and long-term growth" (Organisation for Economic Cooperation and Development Report, 2018:3). Continued innovation

[1] University of Limpopo, South Africa, Corresponding author: collins.ngwakwe@ul.ac.za.
[2] University of Limpopo, South Africa, E-mail: mamoloko.rachidi@ul.ac.za.
[3] University of Limpopo, South Africa, E-mail: joseph.musandiwa@ul.ac.za.
[4] University of Limpopo, South Africa, E-mail: sipho.mokoena@ul.ac.za.

needs funds. Regrettably, access to finance remains a burning matter for entrepreneurs in SMMEs around the globe (Pekmezovic & Walker, 2016).

1.1. The Research Problem

Although some previous research exists on types of entrepreneurial finance, but little research exists on how each type of finance relates with product innovation; this paper bridges this gap and contributes a nuance to existing entrepreneurial finance and innovation. In addition, this paper also contributes uniquely by examining this topic using data from entrepreneurs in 39 countries of the world – covering Europe, Americas, Asia/Oceanic and Africa.

1.2. Research Objective

There are several sources of entrepreneurial finance that SMME entrepreneurs can use to enhance product innovation and productivity in their businesses. The objective of this paper is to explore which of these sources of entrepreneurial financing, i.e. own capital, venture capital, family and/or friends finance, employers finance, government finance or crowd funding, are related to effective product innovation and productivity.

2. Theoretical Framework: Schumpeter's Growth and Innovation Theory and Entrepreneurship

This paper is inclined on the theory of innovation and growth first explained by Joseph Schumpeter an Austrian born renowned economist and scholar of the twentieth century. His theory has for many years refined the current academic understanding of entrepreneurship discourse. Schumpeter's concepts relating to innovation and entrepreneurship are considered to be his distinctive contribution not only to the study of entrepreneurship but also to economics. Over the years Schumpeter has written about innovation and economic development, as well as the potential negative effect of capitalism on entrepreneurship as it (capitalist enterprise) may result into monopolistic structures that would lead to the extinction of an entrepreneur (Schumpeter, 1934). Schumpeter's views and theme were based on the role of innovation and entrepreneurship in economic growth and development. He argued that those who seek profits need to innovate indicating that innovative profits is the determining factor in entrepreneurship and that the search for opportunities that generate value will impact on circular flow of income (Schumpeter, 1934). Schumpeter provided a distinction between invention and new discovery on the one hand and innovation, commercialisation and entrepreneurship on the other. He remarked on the distinction between invention and innovation alluding that invention was an old institutional model of innovation that the inventors contributed in providing potential inputs to entrepreneurial businesses (Cantwell, 2001). Schumpeterian's view is that "Invention is the first occurrence of an idea for a new product or process, while innovation is the first attempt to carry it out into practice" (Fagerberg, 2006, p. 4).

Schumpeter's most relevant contributions was with the treatment of innovation relative to his model of competition that dealt with five economic activities. His view on competition focused on the function of the entrepreneur regarding the introduction of new product or a new type of product that may already exist; the use of new methods of production that has not been proven in the market; introduction and opening of new markets (particularly in the industry where there is no representation); and opening of new sources of supply of the raw materials and the development of new industry structure that may result in creating or eliminating monopoly position (Norton, 2018). He propagated the notion that innovation is a process of ongoing industrial change that constantly transforms the economic structure from within, continually changing the old one and keeping on creating the new one (Harvey, Kiessling & Moeller, 2010). In his analysis he divided innovation process into three categories, often referred to as the "trilogy of innovation", namely; invention, innovation and diffusion. He posits that invention and

innovation phases have less economic and development impact while diffusion and imitation processes are considered to have much high and greater impact (Sledzik, 2013). He argued that in a macroeconomic perspective the effects of innovation are hardly noticeable in a short term (sometimes in the medium term). However, it is only after investment and further development have been affected on the initial innovation (in this instance diffusion and imitation phase) that the imitators start realising profits as new products, investment and new technologies are implemented. It is important to consider that diffusion and imitation cannot be realised in a vacuum however must be based on the initial phases of invention and innovation (Sledzik, 2013).

When the relevance of innovation is considered in the economic process, it is necessary to consider its economic growth impact. Innovation is at the centre of entrepreneurship and it is as a result of innovation that entrepreneurs execute their activities (Drucker, 1998). It is in this regard that innovation is able to stimulate entrepreneurs' activities, thus generating feedback effect. Therefore, entrepreneurship innovates and innovation has an effect to stimulate other entrepreneurs (De Cleyn & Braet, 2012). Schumpeter posits that entrepreneurship activity implies innovation that yields new product, production process and creating a destruction process. The beneficial process of creative destruction therefore leads to the introduction of new products that result in the obsolescence or failure of others (Sobel, 2019). Innovation in entrepreneurship is able to yield creative solutions to the firm's problems, innovative business strategies or creative changes in entrepreneurial process (Zhou, 2018). In essence, the innovator starts new industries, thus creating new structural changes in the industry and to the economy.

For entrepreneurs to create new fundamental structures to any industry availability of capital is of vital importance to innovation. Entrepreneurs must have access to financial resources for developing their activities, including innovation. To note is that the entrepreneur may not be the owner of the capital, however their ability to have access to it is important to innovation. In the context of the current modern era, the availability of efficient credit providing institutions may be what is required. In some countries the banking system and other related institutions are available to access financial resources or credit that is vital in implanting innovation for economic development. Hvide and Moen (2010) alludes to the view that entrepreneurs who have liquidity constrains and are unable to have access to capital are disadvantaged than those that have.

3. Literature Review

Whilst there are various sources of finance for early entrepreneurs, the Global Entrepreneurial Development Institute (2019) documents about eight common sources of finance available to early entrepreneurs. These include venture capital, crowd funding, family financing, friends financing, government financing, banks, own capital and employer financing.

Venture capital refers to equity or equity-linked investments in young, privately held companies, where the investor is a financial intermediary who is typically active as a director, an advisor, or even a manager of the firm (Kortum & Lerner, 2000). Literature present that venture capital funding has an impact on the number of product innovations. It further argues that that venture capital is associated with a substantial increase in patenting. Literature on the financial literacy indicates that crowd funding needs financial literacy among young entrepreneurs. Financial literacy that is above average contributes significantly towards entrepreneurial innovation and skills (Oseifuah, 2010). This argument is supported by Bosma and Harding (2006) who argue that poor financial literacy and inadequate management practices restrict entrepreneurial innovation, such as new product development performance. Pengeran (2016) argues that the impact of entrepreneurial innovations on firm's performance may depend on the effect of contingency.

Early entrepreneurs face greater risk of survival, which emanates mainly from capital limitations

(Shepherd, Douglas & Shanley, 2000); this brings another dilemma, which is that insufficient capital limits the ability of early entrepreneur to engage in product innovation that sustains growth (Bradley, McMullen, Artz & Simiyu, 2012). An empirical examination of effect of venture capital to entrepreneurial innovation indicates that increases in venture capital funding is significantly associated with product innovation and goes as far as enhancing high product innovation, which attracts patenting (Lerner, 2000). Venture capitalists is seen by some researchers as offering a viable early financing option for starter entrepreneurs, mostly because of their zero tolerance for failure as they not only offer capital support, but also provides advice and training to entrepreneurs to improve their businesses. One of the most lauded characteristics of venture capitalists is their patience and readiness to convert their financing to equity and debt capital (Lehner, Grabmann & Ennsgraber, 2015) in the entrepreneurial business, which thus provides a longer form of financing that enhances capital stability and sustenance of product innovation strategies.

Some researchers have recognised the importance of crowd funding for providing easy access to entrepreneurial finance and for making it easier for entrepreneurs to engage in product or service innovation (Bruton, Khavul, Siegel & Wright, 2015). This is achieved faster given the synergy that exists amongst different experts and diverse investment wisdom that subsists among the participants in crowd funding. This makes it possible for entrepreneurs to tap from the wealth of financing and innovation wisdom inherent in crowd funders (Mollick & Robb, 2016). Although bank financing has largely received negative view in the literature as ant-innovative, but some currently literature has tried to point to a different direction citing some positive innovation advantages derivable from bank financing (Robb & Robinson, 2014); they further argue that in some instances that start-ups do get bank funding with little collaterals and in some cases without concrete collateral (Robb & Robinson, 2014).Kerr and Nanda (2015) in their literature survey, point out that start-up firms engage in radical innovation and requires finance to accomplish this.

4. Materials and Methods

Given the objective of this research and the attendant research question, a positivist paradigm was the suitable paradigm for this research. A positivist paradigm approach to research involves the application of quantitative analysis of interaction between numeric variables to determine causes and effects and/or relationships between dependent and independent variables (Mackenzie & Knipe, 2006). The positivist paradigm is justified as this paper involves and examination of relationship between sources of entrepreneurial finance (independent and numerical variables) and the extent of entrepreneurial product innovation (a numerical dependent variable). Hence a quantitative approach was applied and data were gathered from the online global entrepreneurship index of the Global Entrepreneurship Development Institute [GEDI] (2019).

In a Chinese based case study, it was found that financing changes entrepreneurs' innovation strategy to the positive direction (Shi, Gong and Chen, 2019). This finding was limited to Chinese sample of companies implying that a global analysis is absent in the literature. This research expands and bridges this gap by examining how sources of finance relate to entrepreneurial innovation. Thus, using a sample of 39 countries' entrepreneur data, which covered Europe, America, Africa and Asia/Oceanic, a logit model was used to test the relationship. A purposive (non-probability sampling approach) was applied (Ahamed, Mandal, Datta & De, 2019; Etikan, Musa & Alkassim, 2016) in selecting the sample from the GEDI index. The purpose was that the 39 countries' entrepreneur data used contained a full complement of the eight (8) sources of finance, which formed the independent variables used in this analysis; countries that contain less than the eight sources of finance were dropped from the sample.

According to statistics experts (Davidson & MacKinnon, 2004) the Logit model is a limited dependent variable method of analysing relationship between variables when the dependent variable is binary in nature (1 and 0). For instance, in this paper, the dependent variable is product innovation and has been

coded as 1 (one) if product innovation occurs and 0 (zero) if product innovation does not occur. The logit model is represented by:

$$log\left(\frac{p_t}{1-p_t}\right) = \beta_0 + \beta_1\chi_1 \quad (1)$$

Where: $log\left(\frac{P_t}{1-P_t}\right)$ = the logarithm of the odds of product innovation (dependent variable), β_0 = constant, β_1 = coefficient of the independent variable and χ_1 = independent variable

4.1. Results

Table 1. Relationship between Own Captial and Product Innovation

Model: Logit, using observations 1-39
Dependent variable: PrdtInno

	Coefficient	*Std. Error*	*z*	*p-value*	
const	0.0124776	6.57475	0.0019	0.99849	
OwnCpt	0.00369198	0.0691892	0.0534	0.95744	

Null Hypothesis: *There is no significant relationship between own capital and product innovation*
The cases that were predicted correctly = 23 (59.0%)
Value of f(beta'x) determined at the mean of independent variables = 0.242
The Likelihood-ratio-test: Chi-square(1) = 0.00284252, *P* = [0.9575]

The Likelihood-ratio-test in Table 1 shows a p value of 0.95744, which is greater 0.05 significance level. Therefore, based on the P value of 0.095, the null hypothesis cannot be rejected. This means that the analysis does not show a significant relationship between entrepreneurial own capital and product innovation within the 39 countries whose data were used in the analysis. Hence, within this sample, own capital plays no significant role in enhancing entrepreneurial product innovation.

Table 2. Relationship between Family Finance and Product Innovation

Model: Logit, using observations 1-39
Dependent variable: PrdtInno

	Coefficient	*Std. Error*	*z*	*p-value*	
const	1.62496	0.921141	1.7641	0.07772	*
Family	-0.0363305	0.0246521	-1.4737	0.14055	

Null Hypothesis: *There is no significant relationship between family finance and product innovation*
The cases that were predicted correctly = 23 (59.0%)
Value of f(beta'x) determined at the mean of independent variables = 0.241
The Likelihood-ratio-test: Chi-square (1) = 2.33089, *P* = [0.14015]

Given the high Chi-square P value of 0.14 in Table 2, which is greater than 0.05, the null hypothesis cannot be rejected. This means that, within the sample of data used in this test, there is no significant relationship between family finance and product innovation within the 39 countries.

Table 3. Relationship between Friends Financing and Product Innovation

Model: Logit, using observations 1-39
Dependent variable: PrdtInno
entrepreneurial product innovation

	Coefficient	*Std. Error*	*z*	*p-value*	
const	0.162049	0.635412	0.2550	0.79870	
FriendsF	0.0187256	0.0512958	0.3651	0.71507	

Null Hypothesis: *There is no significant relationship between friends financing and product innovation*
The cases that were predicted correctly = 23 (59.0%)
Value of f(beta'x) determined at the mean of independent variables = 0.242
The Likelihood-ratio-test: Chi-square (1) = 0.136498, p = [0.7118

Based on the P value of 0.71 in Table 3, the null hypothesis cannot be rejected. This means that the analysis does not show a significant relationship between friends' financing and product innovation within the 39 global companies. Hence, within this sample, friends' financing plays no significant role in enhancing entrepreneurial product innovation.

Table 4. Relationship between Employer Financing and Entrepreneurial Product Innovation

Model: Logit, using observations 1-39
Dependent variable: PrdtInno

	Coefficient	*Std. Error*	*z*	*p-value*	
const	-0.792652	0.734213	-1.0796	0.28032	
EmployrF	0.135171	0.080268	1.6840	0.09218	

Null Hypothesis: *There is no significant relationship between employer financing and entrepreneurial product innovation*
Cases that were predicted correctly = 23 (59.0%)
Value of f(beta'x) determined at the mean of independent variables = 0.239
The Likelihood-ratio-test: Chi-square(1) = 3.49573, *P* = [0.0615]

Based on the P value of 0.09 in Table 4, which is greater than 0.05. This means that the analysis does not provide adequate significant relationship between employer financing and entrepreneurial product innovation within the 39 countries' entrepreneur data.

Table 5. Relationship between Bank Financing and Entrepreneurial Product Innovation

Model: Logit, using observations 1-39
Dependent variable: PrdtInno

	Coefficient	*Std. Error*	*z*	*p-value*	
const	0.549778	0.951511	0.5778	0.56340	
Banks	-0.00670793	0.0320231	-0.2095	0.83408	

Null Hypothesis: *There is no significant relationship between bank financing and entrepreneurial product innovation*
Cases that were predicted correctly = 23 (59.0%)
Value of f(beta'x) determined at the mean of independent variables = 0.242
The Likelihood-ratio-test: Chi-square(1) = 0.0438845, *p*= [0.8341]

From the high P value of 0.83 in Table 5, which is greater than 0.05, the null hypothesis cannot be rejected given the high Chi-square p value of 0.83. This means that there is no significant relationship between bank finance and entrepreneurial product innovation within the 39 countries' data on entrepreneurship.

Table 6. Relationship between Venture Capital and Product Innovation

Model: Logit, using observations 1-39
Dependent variable: Product Innovation
Independent variable: Venture Capital

	Coefficient	*Std. Error*	*z*	*p-value*	
const	-1.05564	0.741768	-1.4231	0.15469	
VenturCpt	0.121636	0.0579223	2.1000	0.03573	**

Null Hypothesis: *There is no significant relationship between VentureCpt and entrepreneurial product innovation*

Cases that were predicted correctly = 27 (69.2%)
Value of f(beta'x) determined at the mean of independent variables = 0.240
The Likelihood-ratio-test: Chi-square (1)= 5.01525, *P* = [0.0251]

Therefore, based on the P value of 0.02 in Table 6, there is evidence to reject the null hypothesis in favour of the alternative hypothesis. This means that the analysis provides evidence that a significant and positive relationship exists between venture capital and product innovation within the 39 countries' entrepreneur data.

Table 7. Relationship between Government Financing and Entrepreneurial Product Innovation

Model 18: Logit, using observations 1-39
Dependent variable: PrdtInno

	Coefficient	*Std. Error*	*z*	*p-value*	
const	-0.0483353	0.584284	-0.0827	0.93407	
GovtF	0.0231564	0.0277642	0.8340	0.40426	

Null Hypothesis: *There is no significant relationship between government finance and entrepreneurial product innovation*

Cases that were predicted correctly = 23 (59.0%)
Value of f(beta'x) determined at the mean of independent variables = 0.242
The Likelihood-ratio-test: Chi-square (1) = 0.716294, *P* = [0.3974]

Based on the Chi-square Likelihood ratio test at a P value of 0.39 in Table 7, the null hypothesis cannot be rejected given that the Chi-square p value of 0.39 is higher than 5% significant level. This means that there is no significant relationship between government financing of entrepreneurs and entrepreneurial product innovation within the entrepreneurs in 39 countries of the world.

Table 8. Relationship between Crowd Funding and Entrepreneurial Product Innovation

Model: Logit, using observations 1-39
Dependent variable: PrdtInno

	Coefficient	*Std. Error*	*z*	*p-value*	
const	-0.589671	0.546239	-1.0795	0.28036	
CroudF	0.168564	0.0824094	2.0455	0.04081	**

Null Hypothesis: *There is no significant relationship between crowd funding and entrepreneurial product innovation*

Cases that were predicted correctly = 27 (69.2%)
Value of f(beta'x) determined at the mean of independent variables = 0.238
The Likelihood-ratio-test: Chi-square (1) = 5.20433, *P*= [0.0225]

Therefore, based on the Chi-square likelihood ratio with a P value of 0.0225 in Table 8. There is evidence from the p value to reject the null hypothesis in favour of the alternative hypothesis because the p value of 0.0225 is less than 0.05. This means that the analysis provides evidence that a significant and positive relationship exists between crowd funding and entrepreneurial product innovation within the entrepreneurs in 39 countries whose data were used in the analysis.

4.2. Implication of Findings.

This research has proved that apart from the fact that crowd funding provides the much needed early funding by entrepreneurs, which is hardly accessible from conventional means, the foregoing findings in this paper does show that crowd funding cushions and facilitates product innovation, this is not surprising since crowd funders often display loyalty and interest in entrepreneurship business up to the point of equity ownership Lehner, Grabmann and Ennsgraber (2015), which bestows peace of mind and innovative thoughts to the entrepreneurs. The findings also concur with previous research which alludes that funding is important in capital structuring (Yuniningsiha et al. 2019), which also determines the extent a business can innovate.

4.3. Value (Contribution)

The effect of financing on entrepreneurship product innovation is on the rise, but previous research has not exhaustively examined up to eight sources of financing independently on product innovation, equally previous research has not had a global approach using data from entrepreneurs from 39 countries of the world. It is not surprising that in these findings, the government sources of finance proved to be negative on entrepreneurial product innovation as previous research found that government-controlled sources of financing entrepreneurs through central bank has little positive effect on product innovation (Chemmanur & Fulghieri, 2013). This research contributes to the suggestions made in Chemmanur and Fulghieri (2013) for further research along this concept. Again, the findings of this study provide a global perspective corroboration to the earlier findings by Chemmanur and Fulghieri (2013) Florida and Kenney (1988), which highlights that venture capital provides a positive spur to entrepreneurial product innovation, this provides support for entrepreneurs and public policy on the need to embrace the quality of venture capitalists, which chiefly includes failure tolerance.

5. Conclusion

The overarching aim of this paper is to present an empirical examination of the relationship between entrepreneurial sources of financing and product innovation. Many researches on entrepreneurship financing has largely dwelt on reviews and conceptual examination of sources of financing of the problems implicit in these varied sources of finance but very little prior research have presented empirical examination of how different sources of finance affect entrepreneurial product innovation. This paper thus became pertinent to fill existing gap in the literature and contributes a new approach to the existing entrepreneurial finance and innovation literature. Furthermore, this paper also contributes uniquely to existing research by adopting a global approach; this is because the paper made use of global data from entrepreneurs in 39 countries of the world – covering Europe, Americas, Asia/Oceanic and Africa. The data set used in the empirical analysis were retrieved from the Global Entrepreneurship Development Institute's Index, which provides data of global entrepreneurship in different countries of the world.

The data analysis was conducted quantitatively and the Logit statistics model was applied in the analysis of data as the dependent variable was made in binary data fashion. Although there are many different types of entrepreneurial financing, but information from the GEDI (2019) index indicates about eight different types of financing that is commonly available to beginner entrepreneurs namely family finance, friends' finance, own capital, employer's finance, bank finance, government finance, venture capital and crowd funding. In order to see how each of these affect product innovation with the effect of intervening variables, each source of finance was examined independently to ascertain how each source affects product innovation. Findings from the analysis indicate various findings; crowd funding and venture capital sources are significantly and positively related to growth in entrepreneurship product innovation. Although the other variables did not show significant relationship, it is noted that bank finance and family finance sources showed a negative relationship with entrepreneurship product

innovation. Although the employer financing source did not show a significant relationship at 5% alpha level, it was attention-catching to see that employer source of finance showed considerable positive relationship with a p value of 0.09, which not too far away from 0.05 alpha level. Based on these findings, the paper recommends that future research should consider expanding this research by including more countries into the data set. It is also recommended that further research should make use of other empirical methods such as panel regression analysis in order to capture many time series into the analysis. Given that crowed funding and venture capital proved to be helpful in spurring product innovation, the paper recommends that government policy on entrepreneurship should be made to provide enabling environment for the growth of crowd and venture capital funders and the attendant accessibility to early entrepreneurs.

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