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Determinants of new products innovation in Ghanaian SMEs sector

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Abstract

The paper analyzes the determinants of new products innovation in the SMEs sector. The study focused on types of innovation funding and sources of innovation funding. Five-hundred and fifty (550) SME owners were randomly selected for the study. Information was sourced through the use of questionnaires. Tobit model was used for the analysis. Sales value of new products was used a proxy for new products innovation. The determinants were grouped into two types thus innovation expenditure and sources of innovation expenditure. Sources of innovation expenditure have significant influence on new products innovation. From the finding foreign capital, government tax credit, and subsidies had significantly influence on new products innovation. SMEs specific attributes such as patent and having overseas partners influence new product innovation. Policies and programs geared towards government tax credit, subsidies, patent rights and inflow of foreign capital into SME sector should be encouraged since they have the potential of promoting product innovation in the sector.

Keywords: Innovation expenditure, Sources of innovation expenditure, New products innovation, SMEs finance

Introduction

SMEs play a focal role in the economic development of countries especially in the emerging economies. As a result, governments have formulated policies and programs that are geared towards small and medium-scale enterprises (SME). However, this agenda is not without its own challenges. Studies on the difficulties small and medium-scale (SME) enterprise owners face are pointing to a general decay by SMEs on the lack of access to finance and the cost involved in obtaining such funds when they are available (Abor and Quartey, 2010). There have been calls from various stakeholders on the government to direct more funds to the SMEs sector to make it more attractive and competitive in the global market. The growth in the SMEs sector will help in transforming lives at the households and macroeconomic levels.

The very nature of SMEs makes their operation so challenging since they are unable to access finance for their activities. Most SMEs owners are not able to provide collaterals required in granting of formal banking sector loans (Agbola and Ankrah, 2013). To help SMEs survive, governments often offer subsidies and tax credit to promote the growth of SMEs (Zhu et al., 2012). More enterprising SMEs owners secure funding

from financial institutions in the form of loans and Venture Capital. Some also get assistance from angel inventors and overseas investors (Zeng et al., 2010).

There is the growing attention on identifying the factors that support or constrain innovation activities in the SME sector. Funding for SMEs activities plays a critical role in their growth and sustainability as a result; this study seeks to analyze how types of expenditure and financing sources, influence SMEs products innovation.

Prior studies have not fully investigated the relative importance of internal as against external expenditure on research and development (R & D) and technology in the area of new products innovation in SMEs sector. There has also been very little research in the area of whether different external sources of finance improve the SMEs new product innovation. This study therefore seeks to bridge the gap in research especially in the case of developing countries such as Ghana where SMEs are in constant need of funding.

Literature review

The activities of small and medium-scaled enterprises (SMEs) play a crucial role in the economic fortunes of nations and most especially the developing nations such as Ghana. According to Ayyagari et al. (2011) 95% of the enterprises across the globe are SMEs and contribute to about 60% private sector employment. The contribution of SMEs to the GDP is gaining a greater proportion in business share. The share of SMEs to the GDP in Ghana went up to about 49% in 2012 (Nimako et al., 2013). The SME sector has experienced some growth in the last decades; the development is attributed to the few formal avenues for pursuing interest bearing investment options.

The lack of access to affordable source of finance is the major challenge to most SMEs in sub-Saharan Africa (Denton, 2006). Given the imminent role, finance plays in the activities of SMEs there is the need to consider how funding types and sources contributes to new products innovation. In recent times, researchers have started looking into the determinants of SMEs innovation. The study by Deng et al. (2013) found that expenditure on research and development (R & D), human capital within the firm have effect on the new product innovation among Chinese SMEs. Network with the government institutions is said to have limited effect on innovation performance of Chinese SMEs compared to inter-firm cooperation (Zeng et al., 2010). Also study by Xu et al. (2008) found that business networks play a critical role in the innovative performance of SMEs. SMEs face five major constraints: high tax, limited access to the source of funding, inappropriate laws and regulations, unfair competition, and limited support system (Zhu et al., 2012). Tax exemption has been reported to have a positive influence on the new products innovation in the Chinese SMEs sector Newman et al. (2015). As much as these studies and their findings are important, their generalization will be out of place especially where there are notable differences in the level of economic development among countries.

This study therefore looks at how types and sources of funding influence new product innovation in the Ghanaian production SMEs sector.

Research on the influence of expenditure on technology and research and development (R & D) is increasingly gaining attention of many researchers in the entrepreneurial field. Research by Hall et al. (2009), (Bhattacharya and Bloch, 2004) on the Australian and

European SMEs conclude that there is a positive link between research and development (R &D) expenditure and innovation. A study on the Chinese SMEs sector also revealed that, there is a positive and a significant relationship between the R & D expenditure and new product development in the SMEs sector (Deng et al., 2013).

Yet another area that has not received the needed attention in research is whether innovation expenditure on new products varies by type of innovation expenditure. To help look at the effect of innovation expenditure on new products innovation, innovation has been put in the following categories; in-house research and development (R & D) expenditure, expenditure on new machines, equipment, and software, expenditure on external technologies, and external R &D expenditure. According to Deng et al. (2013), total innovation expenditure has considerable influence on new product development. Expenditure on internal R&D and technology is expected to have a greater influence on new product innovation compared to expenditure on external R & D and technologies. A study Swike et al. (2008), on SMEs concluded that SMEs in emerging economies such as China are often not in position to share vital information with their external; the development they said is contrary to the happenings in the developed economies. In the developed economies, because of strong protection of intellectual property rights SMEs owners share information without the fear of losing them. Countries with weak institutional framework, will have a challenge of having their SMEs collaborate well with their external partners in the area of technology sharing.

Studies by Alperovych and Hübner (2013), (Bertoni et al., 2011, Davila et al., 2003) posit that external sources of finance and equity financing are critical to the growth and profitability of SMEs. SMEs that obtain their finance from the external sources such as bank loans, are said to outperformed those that rely mainly on internal source of finance (Keasey and McGuinness, 1990). Studies by other researchers also corroborate this finding. A study by Alperovych and Hübner (2013) concluded that SMEs owners whose source of finance is venture capital outperform their counterparts who rely mainly on internal funding.

Studies into the effect of different sources of finance on new products innovation, is an area that has not receive much attention. To bridge this gap, this study looks at different external sources of finance and their effect on new products development in Ghana's SMEs sector. In this study, we focus on sources of financing innovation from the central government in the form of tax credit, subsidies, bank loans, venture capital (VC), and from oversea partners.

Globalization has led to the transfer of capital between nations. According to Li et al. (2010), there has been an increased movement of financial capital from investors from the developed world to the developing countries. Also, a study by Salomon and Shaver (2005) on SMEs in China concluded that, apart from the transfer of capital, foreign investors also assist Chinese SME owners to obtain know-how and technologies, which contributes to their innovation. A study by Udimal et al. (2017) concludes that human capital influences agribusiness performance but as to whether human capital from foreign or local that influences performance the study was however silent on that. It is argued that government tax credit and subsidies will help propel the growth of SMEs especially in the area of new product innovation. According to Zhu et al. (2012) Chinese government tax credit in the SMEs sector, encouraged investment in R & D.

Tax-based incentives is reported to have encouraged new product development in the North America and European organizations (Cappelen et al., 2012).

There have been calls for tax credit and subsidies to help promote SMEs in Ghana. These calls have yielded the needed attention as government has implemented policies such as subsidies and tax credit to alleviate the suffering of SMEs owners. However, there has not been any empirical study in this regard to assess the effect of the intervention on the growth of SMEs especially in the area of new products innovation. We therefore hypothesize that SMEs that benefited from the government tax credit and subsidies to support their innovation will achieve a higher new products innovation compared with those not benefiting from tax credit and subsidies.

Small and medium-scale enterprises (SMEs) in their bit to boost productivity often seek for external source of funding to support their operations. The external sources range from banks to venture capital (VC). Limiting oneself to internal funding is reported to limit the growth of SMEs especially in the area of new products innovation (Zhu et al., 2012). The study attributed the development to the unstable, short-term, and small nature of internal funding, which is not able to support new products innovation, which requires medium to long-term funding.

Having access to stable and long-term finance will encourage SMEs to invest in research and development (R & D) and technologies that will facilitate new product innovation. We therefore predict that SMEs with access to bank loans and Venture capital will be more involved in new products innovation compared to their counterparts without.

Methodology

Research design

A cross-sectional survey design was used for the data collection. This approach was adopted because it offers researchers the opportunity to have personal interaction with the participants. The study population is the SME owners who are in the production sector. The production sector was chosen because it is the source of raw materials to the other sectors of the economy. Innovation in the production sector will trickle down to other sectors of the economy. The SME owners who are into the production sector were purposively selected for the study. The study focused mainly on SMEs in the production sector whose owners have being in business for the past ten years, since it takes time for a business owner to embark on innovation activities. A simple random sampling technique was used in the selecting the required sample size. Information was gathered through questionnaire. Field enumerators had face-to-face interaction with the SME owners in administering questionnaires.

Because the total number of SME owners in the production sector were unknown to the researchers, we arrived at the sample size by following the approach proposed by (Mann, 2011), using the *z-score* of 1.96 for 95% confidence interval, and 4.4% margin of error were used to get the required sample size. There is no prior judgment for *p-value* and as a convention we used *p-value* of 0.5. Five hundred and fifty SME owners who are into the production sector were randomly selected for the study.

Data collection and analysis

Before the field, data collection field enumerators were taken through the questionnaire to help them understand the questions and the skip patterns where necessary. The training session took a day and enumeration started the following day. The questionnaires were administered through face-to-face approach. Questionnaire administration took place between January to April 2017.

Data entry and analysis were done using SPSS and STATA respectively. Before the analysis data editing was done to get rid of non response items. Data analysis was done using tobit regression model.

The variables

The sales value of the new innovated products was used as the dependent variable for the study. The independent variables were grouped into two categories: the firm’s sources of innovation expenditure and innovation inputs. We adapted some variables that were used by (Newman et al., 2015). These include external R &D expenditure, internal R &D expenditure, expenditure on external technologies, and in-house R &D expenditure. The variables on the sources of R &D expenditure include bank loans, government subsidies, government tax-credit, internal funding, VC, and foreign investor’s capital.

The Table 1 below shows the description of various variables and their mode of measurement.

The Table 2 presents the result on the descriptive analyses.

The empirical model

Tobit regression model is adapted for this study. This is because most of the responses for the dependent variable were zero (Greene, 2003). The normal regression model is not suitable for analysis when the most of the responses are zero, since that will result in the violation of the assumptions (Greene, 2003, Newman et al., 2015). Censoring of data is a common phenomenon in the microeconomic data analysis. In censoring a given range of data in the dependent variable are transformed into a single value. In such instances, the conventional regression model fails to take care of the variations between the limit of (0) observations and non-limit thus continuous observations. The regression model that is based on this is called censored or tobit regression model.

The general formulation is given in terms of its index function,

$$\begin{aligned}
 y_i^* &= x_i\beta + \varepsilon_i, \\
 y_i &= 0 \text{ if } y_i^* \leq 0, \\
 y_i &= y_i^* \text{ if } y_i^* > 0.
 \end{aligned}
 \tag{1}$$

Where $\varepsilon_i \sim N(0, \sigma^2)$. The x_i ’s are observed for all cases. y_i^* is a latent variable that is observed for values greater than τ censored for values less than or equal to τ . The observed y_i is defined by the measurement equation:

$$y_i = \begin{cases} y_i^* & \text{if } y_i^* > \tau \\ \tau_y & \text{if } y_i^* \leq \tau \end{cases}
 \tag{2}$$

The eqs. (1) and (2) combined gives us:

Table 1 Variables' Description

Variable name	Description
Dependent Variable	
Sales value	Sales value of innovated product (\$)
Inputs for innovation	
Independent Variables	
Total Expenditure on innovation	Total innovation expenditure in 2016 (\$)
In-house expenditure	In-house R & D expenditure 2016 (\$)
External expenditure	External R & D expenditure 2016 (\$)
New machines, equipments and software	Expenditure on equipments, software, and machines 2016 (\$)
Technologies	Expenditure on external technologies 2016 (\$)
Government subsidies	1 if SME uses government subsidies to fund its innovation, 0 for otherwise
Government tax credit	1 if SME uses tax credit to fund its innovation, 0 for otherwise
Foreign capita	1 if SME uses foreign capital from investors to fund its innovation, 0 for otherwise
VC	1 if SME uses VC to fund its innovation, 0 for otherwise
Internal funds	1 if SME funds its innovation with internal funds, 0 for otherwise
Bank loans	1 if SME funds its innovation with bank loans, 0 for otherwise
Attributes of the SME	
Patent	1 if SME has patent, 0 for otherwise
Labour force	Number of workers
Education	Number of workers with degrees and above
Protection	1 if SME has an inner protection of its technology, 0 for otherwise
Brand	1 if SME has its own brand, 0 for otherwise
Subsidiary	1 if SME has a subsidiary overseas, 0 for otherwise

$$y_i = \begin{cases} y_i^* = x_i\beta + \varepsilon_i & \text{if } y_i^* > \tau \\ \tau_y & \text{if } y_i^* \leq \tau \end{cases} \quad (3)$$

The tobit model is also used in the situation where there is the need for censoring. Censoring the above equation results in;

$$y_i = \begin{cases} y_i^* = x_i\beta + \varepsilon_i & \text{if } y_i^* < \tau \\ \tau_y & \text{if } y_i^* \geq \tau \end{cases} \quad (4)$$

The coefficients obtained from tobit regression can be interpreted in the same way as those obtained from OLS regression (Roncek, 1992).

Results and discussion

The Table 3 below presents the result obtained from the analysis. Given there are a number of SMEs with zero innovation output their sales value were also zero for the

Table 2 Descriptive analysis

Dependent Variable	Obs.	Mean	S.D	Min	Max
Sales value 2016	217	10.64875	0.5958514	7.359321	11.49272
inputs for innovation					
Independent Variables					
Total Expenditure on innovation 2016	217	9.02281	0.81921	5.804472	11.59727
In-house expenditure on R & D 2016	190	7.713517	1.052106	4.60517	9.193194
External R & D expenditure 2016	189	7.739479	1.067915	4.465908	9.20029
Expenditure on new machines, equipments and software 2016	183	7.556624	1.081386	3.688879	9.615806
Expenditure on external Technologies 2016	155	7.445037	1.101621	3.912023	9.10498
labour force	550	4.058336	0.8125233	1.609438	6.749931
Education	460	2.15652	0.8631822	0	4.882802
foreign capita	550	0.538182	0.4989939	0	1
VC fund	550	0.530909	0.499498	0	1
internal funds	550	0.625455	0.4844459	0	1
Bank loans	550	0.496364	0.5004419	0	1
Government tax credit	550	0.510909	0.500336	0	1
Government subsidies	550	0.441818	0.4970554	0	1
Attributes of the SME					
Patent	550	0.474546	0.4998062	0	1
Internal protection	550	0.632727	0.4825005	1	1
Own brand	550	0.425455	0.4948618	0	1
Oversea Subsidiary	549	0.444444	0.6693983	0	11

All the variables with the exception of dummy variables are in natural log

innovation products as a result tobit model was used, since it better deals with such data best than the OLS model.

A number of hypotheses were supported while others were refuted. The finding supports the hypothesis that access to foreign capital by SMEs owners promotes new products innovation. SMEs that have access to foreign capital experienced greater sales income with respect to new products compared those who do not have access to foreign capital. The finding shows that a dollar increase in foreign capital to SMEs innovation results in about 15% rise in sales income of innovation product. This finding corroborates with the study by Salomon and Shaver (2005), which indicate that SMEs in China that benefit from transfer of capital from foreign investors experience growth in innovation. They attributed the development to know-how and technologies foreign capital owners bring onboard. Access to foreign capital gives the enterprise owner some level of flexibility in their planning compared to those without foreign capital and inadequate self-funding. Opportunity to access foreign capital affords SME owners opportunity to engage in long-term planning, which includes new products innovation. This study therefore puts forward an argument that SMEs that have access to capital from external sources are more likely to innovate than those without.

Access to foreign capital offers opportunity for the SME owners to tap into best practices that have propelled the growth of SMEs elsewhere through their association with

Table 3 The determinant of innovation in Ghana's SME sector

Dependent Variable	Coef	t	P > t
inputs for innovation			
Independent Variables			
Expenditure on innovation 2016	0.166568 (0.289143)	0.58	0.567
In-house expenditure on R & D 2016	-0.03428 (0.08178)	-0.42	0.677
External R & D expenditure 2016	0.119647 (0.079382)	1.51	0.137
New machines, equipments and software 2016	-0.00481 (0.057922)	-0.08	0.934
External Technologies 2016	0.056898 (0.069868)	0.81	0.419
labor force	0.088238 (0.078802)	1.12	0.267
Educational qualification	-0.09539 (0.05297)	-1.8	0.077
Foreign capital	0.1539** (0.070523)	2.18	0.033
VC fund	0.074092 (0.106502)	0.7	0.489
Internal funds	0.283375 (0.209919)	1.35	0.182
Bank loans	-0.04124 (0.070902)	-0.58	0.563
Government tax credit	0.415254*** (0.142193)	2.92	0.005
Government subsidies	0.205381** (0.098935)	2.08	0.042
Attributes of the SME			
Patent	0.178156** (0.081433)	2.19	0.033
Internal protection	-0.19234 (0.118967)	-1.62	0.111
Own brand	-0.19375 (0.14059)	-1.38	0.173
Oversea Subsidiary	0.276763*** (0.093315)	2.97	0.004
Constant	7.094227*** (0.849644)	8.35	0.000
Observation	550		
Pseudo R ²	0.5584		
σ	0.324149*** (0.038678)		

The values in parenthesis are standard errors; ***, **, * represents 1%, 5% and 10% significant levels respectively

foreign capital owners. Embarking on innovative activities is herculean task for most SME owners due to finance and its related issues (Bravo-Biosca et al., 2014). This study again corroborates the work of (Nanda and Nicholas, 2014), which notes that external sources of funding play a major role in the firms' innovation process. The study notes that not only does external funding impact the rate of innovation, but changed the trajectory of innovation away from more experimental, radical innovations to incremental and sustaining innovations.

Government subsidies and tax credit have significant positive effect on new products innovation sales income. Compared to other sources of financing SMEs, they were found to have a significant influence sales income. A unit increase in government subsidies and tax credit directed at innovation results in about 42% and 21% increase in sales income of new product respectively. Subsidies and tax credits are a form of relief to SME owners; as a result, it affords.

them the opportunity to engage in long-term activities including new products innovation that they could not have stepped into in the absence of such relief. Government sources are mostly among the few sources of external funding available to SMEs most especially high-risk enterprises. Governments through grants and tax incentives support SMEs in their innovative process (Bravo-Biosca et al., 2014). A study by Zhu et al. (2012) on Chinese government tax credit in the SMEs sector, concluded that tax incentives encourages investment in R & D, which result in new innovation products. Tax-based incentives are reported to have encouraged new product development in the North America and European organizations (Cappelen et al., 2012). As a way of encouraging SMEs to innovate, tax credits and subsidies policies should be directed at SME sector.

Having an affiliation with an oversea or local company has a positive significant influence on new products innovation. The SME owners who operate as subsidiaries of companies either local or abroad have high affinity to new product innovation. Being a subsidiary increase the chances of new products innovation by 28%. Affiliation offers SME owner the opportunity to engage in active learning with the mother company, adapt their activities and processes to the benefit of the subsidiary. Being a subsidiary comes with benefits that could not have been accessible to the owner if he/she was operating alone. The technologies, inputs and know-how of the mother company are some of the benefits the subsidiary benefits hence their ability to go into new products innovation.

Patent application shows a positive significant effect on new products innovation with the SMEs sector. Having a patent application increases the SMEs new product innovation by 18%. New products innovation comes at cost, which takes time to be recovered as a result, enterprise owners will only venture into new products innovation if one is sure of protection his/her intellectual property.

Conclusions

The study specifically looked at the determinants of innovation in the Ghanaian SMEs sector, with emphasis on types of innovation expenditure and sources of innovation expenditure. Five-hundred and fifty SME owners in the production sector were randomly selected for the study.

It is established that the sources of innovation expenditures play a critical role in new products innovation. Having access to foreign capital, government tax credit and subsidies were found to have influence on new products innovation. SME owners who have had foreign capital, benefited from government subsidies and tax credit were more incline to new products innovation.

On the SMEs specific attributes, it was found that having patent right and an overseas subsidiary has a significant influence on new products innovation. Also being a subsidiary with foreign companies influences new products innovation. Patent application has influence on new products innovation in the SME sector. It was revealed that SME owners who have property rights on their intellectual properties engage more in new products innovation compared to those without.

Based on this finding, we therefore recommend that government pursue policies and programs that will improve the image of the institutions in the country. By so doing investors' confidence will be improved and that will lead to more inflow of foreign capital into the country. It will also improve institutional image, which build good relationship between domestic SMEs owners and their foreign counterparts.

We suggest government tax credit and subsidies support to SMEs owners be given the needed attention, since it has positive effect on new product innovation.

We suggest that intellectually property right law be enforced to the latter. This will encourage individuals to invest in new products innovation, since they will be sure of their sole right to the innovation.

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Availability of data and materials

The dataset used for the study cannot be made public because researchers did not seek the consent of the participants. Hence the data can only be made public through the corresponding author on reasonable request.

Authors' contributions

TBU conceived the study, participated in its design and theoretical review, performed the regression analysis and drafted the manuscript. ZJ collected the data and contributed to the review of existing studies and to the discussion. AAIM contributed to the review of existing studies and to the discussion. CH contributed in the analysis of the data, interpretation and drafting of the manuscript. All authors read, reviewed the intermediate versions and approved the final version of the manuscript.

Competing interests

The authors declare that they have no competing interests.

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