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Benefitting from alter resources: network diffusion and SME survival

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This study examines the usefulness of alter resources for the survival of small and medium scale enterprises (SMEs) in Ghana. We utilize data from two rounds of poultry SME network surveys and accompanying SME attributes between 2014 and 2015. We focused on the resources that diffuse to SMEs from alters and the mechanism through which these resources diffuse. We observed that alter markets and technological resources are significant for the survival of SMEs in our sample. We also explored the effect of variations in alter resources along the lines of the type of resource being diffused and found that market resource spill overs have a positive effect while technological resource variations have a negative effect, but these do not rise to significance. Finally, we assessed the impact of the mechanism through which the resources are diffused and found that both direct and indirect tie mechanisms have a positive effect on survival but the effect of direct ties was higher than that of indirect ties.

Keywords: diffusion of innovations; networks; alter resources; SME survival; Ghana

Cette étude examine l'utilité de modifier les ressources pour la survie des PME au Ghana. Nous utilisons les données de deux séries d'enquêtes sur le réseau de PME de volaille et accompagnant les attributs des PME entre 2014 et 2015. Nous nous sommes concentrés sur les ressources qui diffusent aux PME des altérations et le mécanisme par lequel ces ressources diffusent. Nous avons observé que les marchés et les ressources technologiques sont importants pour la survie des PME de notre échantillon. Nous avons également exploré l'effet des variations des ressources sur le modèle de la ressource diffusée et avons constaté que les retombées sur les ressources du marché ont un effet positif et les variations des ressources technologiques ont un effet négatif, mais elles n'ont pas de signification. Enfin, nous avons évalué l'impact du mécanisme par lequel les ressources sont diffusées et constaté que les mécanismes de liaison directe et indirecte ont un effet positif sur la survie, mais l'effet des liens directs était plus élevé que pour les liens indirects.

Mots-clés: Diffusion des innovations ; Réseaux ; Ressources d'altérations ; Survie des PME ; Ghana

1. Introduction

Small and medium scale enterprises (SMEs)[1] in developing parts of the world face several resource constraints. These constraints include raw material supplies, market, technological, quality labor, and transport resources (Kayanula and Quartey 2000; Abor and Quartey 2010; Acheampong and Esposito 2014). In order to address these challenges, some authors have called for collaborations among SMEs for better resource sharing.

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Lichtenthaler (2008), for instance, asserts that SMEs can reap greater benefits from external collaborations as these can compensate for the scarcity of internal resources and competences. Mcdade and Malecki (1997) have suggested that in industrial estates, resource sharing is very common among individual entrepreneurs as a mechanism for overcoming the resource constraints that they face. Narteh (2008) who also studied knowledge as a resource and its transfer within the context of collaborations between developed and developing countries, reports that the resource and the mechanism of transfer are critical to the usefulness of the resource. Hinson and Sorensen (2006) have also noted that the Internet is a mechanism through which resources can diffuse to small business exporters in Ghana.

The sharing of resources requires a network of other firms that an SME can draw these resources from. SMEs are embedded in enterprise networks that provide opportunities for their successful operations (Naudé et al. 2014; Acheampong, Narteh, and Rand 2017). This implies an organizational contagion effect where enterprise resources diffuse through network connections for the benefit of another enterprise (Borgatti and Foster 2003). The ultimate distribution of entrepreneurial behavior and management can be viewed as a function of the structure of the underlying enterprise network. Also, when a single enterprise is considered, its adoption of a practice or behavior is determined by the proportion of alters (other connected enterprises) surrounding her that have adopted that behavior (Zaheer, Gozubuyuk, and Milanov 2010). The alters of this single enterprise represent the surrounding enterprises that are connected to that enterprise in the network in which it is embedded (Scott and Carrington 2011). The resources available to the alters that can be tapped by the single enterprise of interest represents the alter resources, while survival is operationalized as the persistence of an SME from one year to another.

The literature implies a diffusion of resources from an actor in an enterprise network to its alters that may require such resources. The diffusion of innovation (DoI) theory proposed by Rogers (2010) has been employed to explain this phenomenon. The theory suggests that such innovations need to diffuse through a medium over time in a social system to be made available to other units that require them. This means that the innovation to be diffused, the channel of diffusion, the timeline, and the social system within which the diffusion takes place are relevant. Here, innovation refers to the idea or practice perceived as new by another unit; the channel of diffusion is the means by which innovation gets to other units as a new practice worthy of adoption; time refers to the process and period it takes for one decision-making unit to adopt the practice or idea from another; and social system is the set of interrelated units that that engage in joint problem solving to accomplish a common goal (Rogers 2010).

In this study, the practices of an SMEs alters are considered as innovations as they may be new to it; the network connections between the two SMEs in a network are considered as the channel of communication, and the enterprise network is considered the social system within which this flow of resources takes place. Since, we do not hold data on the rate of flow of resources and study a single network, we hold these two constants. Consequently, this study explores the market and technological resources held by an SME's alters and its usefulness for their survival. Also, marketing and technological capabilities vary among SMEs alters. If we consider that SMEs must make a decision as to which of the alters' resources it needs to adopt for its usage, then choosing the wrong technology can have negative influences on the survival chances of the business. The question then is: does such variability matter for the survival of SMEs? Again, can the mechanism through which resources diffuse, among alters, be both direct and indirect?

Pursuant to these research questions, we collected network data from SMEs in the poultry industry in some districts of Brong Ahafo Region of Ghana. We use and limit our study to this industry and study site because it enables us to control for network sprawl (Hanneman and Riddle 2005). According to statistics from the National Veterinary Office and the Food and Agriculture Organization (FAO), the cluster is one of the best[2] in the country in poultry production (FAO 2014). The sector is also a critical case for the industry considering it is one of the best performing poultry clusters in the country. We argue for the generalizability of the findings to other clusters in line with Flyvbjerg (2006), who noted that critical case studies can be extrapolated for other cases in line with the black swan argument. We then modelled survival into 2015 as a function of lagged independent variables from 2014. We find that the resources, and the mechanisms through which the resources diffuse have a positive association with survival, while the variations have no significant effect; however, market resource variations have a positive effect while technological resource variations have a negative effect.

The study makes significant contribution to theory and practice. In terms of theory, the study contributes to the DoIs theory by suggesting that the alters of an enterprise can influence the diffusional outcomes that the enterprise can achieve (Zane and DeCarolis 2016). This influence takes place through the flow of resources on the linkages between the enterprises in the network. Again, the study is able to integrate the theory of diffusion with the social network theory by modelling the flow of resources on inter-organizational network in Ghana. The study also makes a contribution to the importance of the nature of the channels through which resources flow for SME outcomes. Practically, the study suggests that alter resources are useful for SME survival, and that both direct and indirect resources matter as well. In the following pages the literature and hypotheses, the research methods employed, our findings and the conclusions derived from the study are discussed.

2. Literature review and hypotheses

Borgatti and Foster (2003), in a review of network studies, argue that diffusion occurs in networks in the form of shared attitudes, culture, and practices. This occurs through the interaction between an actor and its alters linked by their ties. Therefore, a given actor's adoption of a particular culture, attitude, or practice is dependent on the number of its alters that have that attitude, culture or practice and its intensity. The theoretical mechanism that has been used to explain this phenomenon is the DoI theory (Rogers 2010). The theory defines diffusion as the process through which an innovation is communicated through a certain medium over time among members of a social system. Consequently, we define diffusion within the context of networks in this study as the process by which the resources of an actor are made available to others through its ties over time among SMEs in an industry network. Four main issues emerge: (1) the alter resource; (2) the medium of transfer; (3) time; and (4) the network. This study focuses on the alter resource and the medium of transfer of the resource since the time and network are fixed for all the SMEs and offer no variation. However, the effects of variation in alter resource outcomes on SME survival are included and tested as part of the model. In the following paragraphs, we discuss and hypothesize these issues.

2.1. The alter resources, variations, and SME survival

This section focuses on two alter resources and the variations in them that an SME can appropriate for its survival. These are market and technological resources, and their

consequent variations because different alter have different resource capabilities. The first alter resource that is discussed is market resources. An actor's marketing competence in the network is based on their level of market orientation (MO) (Kohli and Jaworski 1990). MO is derived from the application of marketing concepts suggesting that the key to organizational success is through the determination and satisfaction of the needs, wants, and aspirations of target markets (Mahmoud and Yusif 2012). MO is therefore a cultural orientation with behavioral implications since it channels organizational efforts towards learning about markets and developing strategies in response to market threats and/or opportunities (Cambra-Fierro et al. 2011). Parry et al. (2012) found that marketing orientation is useful for small business performance. An SME with higher levels of MO will have greater access to the market resources than those that do not, and can therefore offer some of these to other SMEs to which it is connected. Consider an SME that, due to its market competences, receives a large order it is not able to meet on its own. It would likely contact other SMEs with whom it has ties so as meet that order and satisfy the customer. The other SMEs that are contacted will therefore be benefitting from their alter market resources. Consequently, it is hypothesized that:

H1a: SMEs with ties to alters rich in market resources are more likely to survive

However, alters are likely to have differing levels of market competences and therefore resources which it can offer to an SME. Can these variations have a negative effect on SME survival? In terms of market resources, this is less likely to be the case as an SME will only be selling to diverse markets and is more likely to give it bargaining power (Cook and Yamagishi 1992). Consider the situation where an SME receives 'help orders' from its alters to meet customer requests: whether small or large, this should not negatively affect the functioning of the SME since a sale is still made. The only case in which a negative effect may occur is when the help order is not feasible and the alter thus exerts exceeding pressure on the SME to the extent that it is not able to meet its own customer needs. However, this situation is unlikely to occur in the study area and in many agricultural enterprises where supply usually outstrips demand (Adei and Asante 2012; FAO 2014; Sumberg et al. 2013) and demand of all kinds are likely to be welcome. Consequently, it is hypothesized that:

H1b: SMEs with high variations in alter market resources are more likely to survive

The next resource that is considered is technological resources. Technological resources are very important within the context of SMEs as they allow businesses to expand quickly and efficiently by serving as an enabler of production and service functions (Aa and Elfring 2002). Segarra and Callejon (2002) noted that technology is very important to the survival of small businesses, focusing on Spanish data and evidence, mentioning it as a key variable in market structure and dynamics, in line with the Schumpeterian market theory. They also concluded that the SMEs which face the lowest exit probabilities are those that had better technologies. Despite the importance of technology to the operations of SMEs, low usage still persists (Zane and DeCarolis 2016). This has largely been attributed to financial and organizational factors (Consoli 2012). Finance is a major challenge as the initial capital outlay required to buy new technology is usually very high and most of these SMEs are not able to acquire them. It is also important to note that SMEs are usually credit constrained (UNCTAD 2001), and therefore this problem can only be compounded. Again, even when the technology is available, there is the lack of sufficiently skilled labor and a coherent strategy to utilize the technology (Kayanula and Quartey 2000). However, according to Rogers (2010), the biggest reason why SMEs may not be

adopting new technologies is the lack of information and uncertainty. This is because SMEs can source for funds to finance new technology and possibly train employees to use the technology, but if they are unsure about its possible benefits then adoption becomes problematic. However, having ties to alters with these resources and competences can help reduce the uncertainty associated with new technology, especially when the technology has led to increases in the production of their alters. Consequently, it is hypothesized that:

H2a: SMEs that have alters with high technological resources are more likely to survive

In reality, an SME can have more than one alter, and these may vary in their technological competences. This makes the evaluation of the technology even more difficult, compounding its associated uncertainty especially when the reason why SMEs look to their alters is for information to erase the uncertainty associated with new technology (Rogers 2010). Consequently, high variation in the technological resource existence and competences can have a negative effect on SME outcomes. This is because the SME may not be able to validate the technology and hence may not adopt it and suffer from using obsolete technology. We therefore hypothesize that:

H2b: SMEs with high variations in alter technological resources are less likely to survive

2.2. Direct ties, indirect ties, and SME survival

Resources that flow from one alter to another require a medium. The DoI theory suggests that these are communication channels (Rogers 2010); but within this study, these are considered as the ties that exist between the alters. These ties can be direct or indirect (focus on distance two) within the inter-SME network. Distance two here refers to ties that are two SMEs away from the originating SME. We start our discussion with the direct ties. The number of direct ties an SME maintains has been known to positively influence organizational outcomes (George et al. 2001). Their influence is in the form of knowledge sharing, complementarity, and scale (Ahuja 2000). SMEs in clusters can share knowledge on best practices leading to higher levels of performance and sustained growth. They also achieve complementarity by bringing different skill sets to perform a task, especially when it comes to meeting the orders of larger corporate clients where one SME capability may not be enough to achieve the required output (Thomason, Simendinger, and Kiernan 2013). This is related to the scale factor. Increasingly, SMEs (especially agricultural ones) must meet the raw material requirements of institutional buyers; and collaboration enables them to access support from their immediate environment to meet these large-scale project demands. Strong direct ties can help SMEs achieve these benefits (Granovetter 1973) through exploitative behavior (Rowley, Behrens, and Krackhardt 2000) and embedding (Uzzi and Lancaster 2003). Direct ties can be seen as strong ties with which an SME has a relationship with another SME. SMEs with a direct, strong, or intense relationship can easily access resources from each other, whether it is knowledge, complementary skills, and/or scaling opportunities. The same can be said for exploitation and embedding, where SMEs can exploit or utilize their immediate contacts to gain access to knowledge, complementary skills, and scaling opportunities. Taken together, resource access from direct ties represents local (an actor's immediate neighborhood) resource utilization (Zaheer, Gozubuyuk, and Milanov 2010). However, since we discuss diffusion from a given SME's alters, such direct ties will have to be in an incoming direct tie form. Consequently, it is hypothesized that:

H3: An increase in a given SME's incoming direct ties is associated with a higher survival probability

Beyond direct incoming ties, SMEs can also benefit from the diffusion of resources from indirect ties. Indirect ties refer to the ties an actor has outside its local neighborhood as a result of ties or connections held by its direct ties to other ties it has no direct tie to. This is popularly referred to as the 'friend-of-friend' phenomenon (Goodreau, Kitts, and Morris 2009). Indirect ties can be a resource gathering and/or processing/screening mechanism (Ahuja 2000). In SME networks, resources can diffuse from SMEs to other SMEs beyond their immediate catchment area to access information and resources that may be critical for their functioning and existence. Indirect ties can also be used to screen information received from direct ties. For example, if information received from a direct tie is different from what is sent to its other direct ties, then the trustworthiness of such information should be doubted. Closer indirect ties can also be used to screen information flowing to the SME from much more distant indirect ties. Indirect ties can also be thought of as weak ties (Granovetter 1973), an explorative mechanism (Rowley, Behrens, and Krackhardt 2000) and/or arm's length relations (Uzzi and Lancaster 2003). The weak ties explanation suggests that SMEs with many indirect ties will be able to access resources from other SMEs that are not in their immediate environment. This lends itself to the flow of resources between groups rather than within groups. Linked to this idea is the explorative mechanism of indirect ties. If SMEs move from their immediate groups in search of resources that can be thought of as explorative compared to exploiting the local resources which direct ties offer, the resources can then diffuse through the tie mechanism to the SME that sought while accounting for decay. This is because the more distant the indirect tie is, the less reliable the resource is likely to be. Exploration offers the SME the chance to gain resources that are not in its immediate catchment area. The arm's length part of the argument suggests that indirect relations are cool, impersonal, and atomistic, and therefore require less investment. SMEs can activate them as and when resources are needed. This helps to largely avoid the constraining effects of over-embeddedness. Also, Burt (2005) argues that indirect ties can serve as hubs for resources and the maintenance of network connectedness that are necessary for network efficiency. These are alter resources SMEs can draw on when needed for survival, especially when critical information and resources flow though these hubs. Taken together, indirect ties represent global access to resources by an SME embedded in a network. Consequently, it is hypothesized that:

H4: An increase in a given SME's indirect ties is associated with a higher survival probability

3. Research methods

3.1. Data collection and network survey

The sample for the study was constructed from databases from the Veterinary Service Directorate, Poultry Farmers Association, and the Egg Sellers Association (Acheampong, Narteh, and Rand 2017). When the whole list was compiled and recurring farms were deleted, there was a total of 163 farms. We contacted all the farmers for interview, out of which 155 farmers participated in the study, representing a response rate of 95.05%. The average interview took approximately 45 minutes. The farmers were asked for information regarding enterprise characteristics, owner characteristics, and general organizational

and technical competences. In relation to the network data, farmers were asked to name other farmers in the study area that they collaborated with for the purposes of their business in line with the multiple name generator approach (Rooks, Szirmai, and Sserwanga 2012). We then checked if the names provided were on our list; if not, we further checked the location of the named farm. In most cases, we found that farms that were not on our list were outside the study area and consequently were discounted for network boundary validity purposes (Boutilier 2007; Carpenter, Li, and Jiang 2012). After every interview, the face validity of the responses was assessed by ensuring that respondents had evidence to support the existence of a link. If none was produced, the link was discounted. Two rounds of data were collected for the purposes of this study. The first round of data was collected in January 2014, and the second round of data was collected in March 2015.

3.2. Measures and operationalization

3.2.1. Dependent variable: SME survival *(SURV)*

The study conducted two rounds of data collection in 2014 and 2015, respectively. The SMEs that persisted between 2014 and 2015 are deemed to have survived over the period while those that did not persist were deemed to have failed. SMEs that survived were coded as 1 and those that failed were coded as 0. At the end of the period 63 SMEs had failed while 92 survived, out of the participating 155 SMEs.

3.2.2. Variables of interest

3.2.2.1. Alter resources.   This refers to the attributes of a given SME's alters that can diffuse for its use. For this, consider that an SME has 3 incoming alters with 4, 6 and 2 levels of competences for a particular resource. For the amount of resources available to the SME, we sum the alter competences and divide by the number of alters: in this example, we arrive at 4. Formally, we represent this as:

$$AR_i = \left(\sum EN : \ i < -j_c\right)/n_i$$

where AR_i is the average amount of resources available to the SME from its alters; EN is the enterprise network within which the SME is embedded; i is a given SME; j_c is the total incoming degree of the SME with associated resources from a given alter; and n_i is the number of alters the SME has. This approach is used to compute the market and technological resources made available to the SME from its alters. This approach requires that we know the competence levels of all alters in the network. For market resource, we used the MO of alters in the network. This is operationalized as customer meetings, informal customer discussions, and review of marketing approaches. This was measured using a Likert scale with 1 as strongly disagree and 7 as strongly agree. We then summed the responses and averaged it to obtain the average MO. Technological competences were operationalized it with the question: 'we adopt new technology to improve work' as one of the questions for absorptive capacity. This was placed on a Likert scale between 1 and 7 with 1 being the lowest adopter of new technology, and 7 being the highest.

3.2.2.2. Variations in alter resources.   In the considered example under alter resources, we find that alters have varying competences. Do these variations have implications for SME survival? To measure this variable, we compute the standard deviation in alter

competences. This is represented as

$$\sigma = \left[\sum (x_j - x_m)/n_i \right]^{1/2}$$

where σ is the standard variation in alter scores for a given SME; x_j is the score of a particular alter; x_m is the mean of alter scores for a given SME; and n_i is the number of alters the SME has. This approach is used to compute the variations in technological and market resources.

3.2.2.3. Direct resources.   We operationalized the direct resources that diffuse to a given SME with the incoming degree centrality of the SME. This is because the resources are assumed to flow from alters to the SME. We compute this with the formula (Borgatti 2005):

$$D_i = \sum EN : i < - j$$

where D_i is the incoming degree of a given SME; EN is the enterprise network; i is a given SME; and j is a given alter.

3.2.2.4. Indirect resources.   Resources can also flow from the friends-of-their-friends and beyond. However, for the purposes of this study we limit it to distance two. That is, the ties of SMEs ties. We use the eigenvector centrality that measures the popularity of a given SME's ties to operationalize indirect resources; however, using this measure alone will fail to account for the SME's own tie to the SME. We therefore subtract the degree centrality of the SME from the eigenvector centrality to arrive at only the popularity of the tie without the SME in question. What this effectively does is that it sums all ties of distance two to our given SME, while discounting that SME's own tie. We can represent this mathematically as

$$ID_i = \left\{ [\lambda \sum EN_{ij}e_j] - [\sum EN : i < -j] \right\}$$

where ID_i is the indirect resources diffusing to a given SME i from a given alter j; EN is the enterprise network; and λ is a constant required so that the equations do not have a non-zero solution.

3.2.2.5. Covariates.   In this section, we present the covariates that were used as controls in our models, how they were operationalized, and their sources in the academic literature. We begin with demographic factors that influence enterprise outcomes (Acheampong et al. 2014). Age of SME: the number of years the enterprise has been operating (Le Mens, Hannan, and Pólos 2014). Generalist (GEN): whether an enterprise undertakes only broiler or layer farming (0), or whether an enterprise does both (1) (Carroll, Dobrev, and Swaminathan 2002). Size: the number of employees the enterprise has (Tsvetkova, Thill, and Strumsky 2014). Education: whether the owner has attained secondary education or higher is 1 and otherwise 0 (Jo and Lee 1996). Experience: the number of years of industry experience the owner has, including prior to establishing the enterprise (Jo and Lee 1996). Gender: the gender of the enterprise owner if male is 1 and 0 if female (Park 1996). Mellahi and Wilkinson (2004) have argued that managerial capabilities influence

the survival of firms. Consequently, issues such as entrepreneurial capabilities, MOs, absorptive capacity, and dynamic capabilities that help steer firms' strategic outcomes need to be accounted for in the attempt to understand the role of later resources in SME survival research. Entrepreneurial orientation: this is operationalized as the risk taking, proactive, and innovative tendencies of the enterprise (Jantunen et al. 2005). MO: this is operationalized as customer meetings, informal customer discussions, and a review of marketing approaches (Kohli, Jaworski, and Kumar 1993). Absorptive capacity: this is operationalized as new information search, cross-enterprise problem solving, knowledge application, and adoption of new technology (Flatten et al. 2011). Dynamic capability: this is operationalized as business planning, on-the-job training, and effective industry benchmarking (Protogerou, Caloghirou, and Lioukas 2011). Managerial competencies of entrepreneurial orientation, MO absorptive capacity, and dynamic capabilities were measured on a Likert scale from 1 as strongly disagree and 7 as strongly agree, summed and standardized. Technical competence: another competence that was controlled for is the technical competence of the SME in poultry production. We proxy this variable with the SME's ties to technical agencies and companies such as the Veterinary Services Department and the Ministry of Food and Agriculture. The number of ties was used as the level of competence. Investment climate constraints: this was operationalized with 16 self-reported constraints in the business operating environment (Acheampong and Dana 2017). The constraints included access to finance, labor quality, tax rates, inflation, and transport infrastructure. The questions were implemented with a Likert scale from 1 to 7. The respondents were to indicate 1 when the variable was not a constraint and 7 when it was highly constraining. We then summed all the responses and standardized the variable for each respondent for a composite investment climate score (Bigsten and Soderbom 2006).

3.3. Model specification

To examine the relationship between network diffusion and enterprise survival, we generated four probit models. The first model investigates the relationship between covariates and survival; in the second model, we add the direct and indirect resource variables; in the third model, we remove the direct and indirect resources and replace that with alter market resources and its variations; and in the final model, we replace market resources with technological resources. We specify the general probit model as

$$P(ES_{t+1} = 1) = \Phi(\beta_0 + \beta_1 SME_t + \beta_2 OC_t + \beta_3 MCOMP_t + \beta_4 ICC_t + \beta_5 M_t + \varepsilon_t)$$

where ES_{t+1} indicates that an SME survives from period t (2014) to $t + 1$ (2015); SME_t is a vector containing SME characteristics; OC_t represents owner characteristics; $MCOMP_t$ is a vector containing SME competencies and capabilities; ICC_t represents perceived effects of investment climate on business operations; and M_t is the vector containing the main effects. These are the direct and indirect resources diffusing to a given SME from its alters, alter resource competences and variations in alter resource competences; ε_t is the statistical noise and Φ is the cumulative distribution function of the standard normal distribution. The magnitude of the coefficients of the probit model cannot be interpreted, and hence we estimated for the average marginal effects of the model that can be interpreted. The UCINet software is used to extract the variables of interest such as alter resources, variations in alter resources, direct ties, and indirect ties (Borgatti, Everett, and

Freeman 2002), while STATA 13 is used to estimate the relationships between the constructs.

4. Results

In this section, we present the findings of the data analysis.

4.1. Descriptive statistics

We first present our descriptive results in Table 1 below. The mean direct resource available from a given SME's alters is 1.974 while that of indirect ties is 2.080, indicating that SMEs benefited slightly more from indirect alters than they did from direct alters. However, the standard deviation was much higher for indirect alters, also indicating a high variation in scores. When we compare the means of surviving and failed SMEs, we find that surviving SMEs have higher mean scores relative to the failed ones. The mean for alter market resources was seen to be higher than that of alter technological resources. This is consistent in the total surviving and failed samples. This may indicate that actors in the enterprise network have more marketing capabilities available to them than technological. In terms of variation in these alter resources, we find that there is a greater variation in the technological resources; and even when the sample is decomposed into failed and survived SMEs, the same pattern emerges. In terms of enterprise characteristics, the majority of the SMEs had approximately six paid employees and specialized in layer production (74.2%). When we considered owner characteristics, most of the owners had at least attended secondary school (52.9%), were male (74.8%), and had an average of nine

Table 1. Descriptive statistics.

	Total sample		Survived sample		Failed sample	
	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.
Direct alter resources	1.974	3.355	2.717	4.157	0.889	0.764
Indirect alter resources	2.080	5.558	3.830	6.505	−0.475	1.858
Alter market resources	3.230	1.899	3.833	1.503	2.350	2.077
Variation in alter MRs	0.409	0.735	0.611	0.843	0.113	0.387
Alter technological resources	2.697	1.866	3.226	1.718	1.923	1.814
Variation in alter TRs	0.473	0.827	0.678	0.925	0.174	0.537
Age of SME	7.497	6.077	8.261	6.551	6.381	5.157
Size of SME	6.348	11.196	8.489	14.050	3.222	2.218
Generalist	0.258	0.439	0.065	0.248	0.540	0.502
Education (>Primary = 1)	0.529	0.501	0.435	0.498	0.667	0.475
Owner experience	8.961	6.698	10.837	6.780	6.222	5.581
Male	0.748	0.435	0.772	0.422	0.714	0.455
Technical competence	0.955	0.914	1.109	0.977	0.730	0.766
Entrepreneurial orientation	−0.104	1.002	0.319	0.936	−0.721	0.747
Market orientation	−0.099	0.990	0.252	0.968	−0.612	0.779
Dynamic capability	−0.121	1.016	0.344	1.040	−0.799	0.436
Absorptive capacity	−0.185	0.949	0.149	0.935	−0.672	0.740
Investment climate constraints	−0.205	0.964	−0.593	0.901	0.362	0.752

years' industry experience. It is however important to note that the number of paid employees and owner experience showed a great deal of variability with standard deviations of 11.196 and 6.698, respectively. The correlations between all the variables have been presented in Table A1 in the appendix below. The mean score of technical competence was 0.955 with a standard deviation of 0.914. Managerial competence and investment climate constraints were standardized, and hence we expected their means to approach 0 and the standard deviations to approach 1.

4.2. Regression analysis

We now turn to the results of our econometric model in Table 2 below. We first discuss the fit of our models to the data. All our models had significant Wald statistics with the exception of model three which contains the covariates and alter market resources and its variations. This shows that the model is not significantly better than the null likelihood model, but we still interpret the significant variables in the model since they are still useful individually in predicting survival of SMEs. In terms of the variance explained by our models, we find that none of our models had a pseudo *r*-square less than 0.733, implying that our models explain at least more than 70% of the variance in the survival outcome. When we considered the variables of interest, we found that direct and indirect alter resources have a significant and positive effect on survival (0.081^{***} and 0.011^{***}); however, the coefficient for direct resources is higher than for indirect. We found that alter market resources have a positive effect (0.032^{**}) on probability of survival and the variation in market resources is also positive (0.036) but it does not rise to significance. We observe that technological resources from alters have a positive effect (0.020^{*}) on survival of SMEs while variations in technological resources from alters have a negative effect (-0.012) on survival, but it does not rise to significance. We find that age and size of SME have a positive effect on survival but only the size of SME rises to significance. We find that SMEs that are generalists are less likely to survive compared to specialists. In terms of owner characteristics, education and owner experience have a positive effect on survival but male-owned farms are more likely to fail than female-owned ones. In terms of organizational competences, we find that entrepreneurial orientation, MO, absorptive capacity, and dynamic capabilities have a positive effect on survival. Technical competence in poultry production is seen to have a positive effect on survival. Investment climate constraints unsurprisingly have a negative effect on survival of SMEs.

5.   Discussion and implications of results

In this section, we discuss the findings of the study in line with existing literature. The study sought to explain whether network diffusion was useful for the survival of SMEs by utilizing alter resources. More specifically, we focused on the direct and indirect mechanisms through which the resources are made available; the particular resource – market and technological – as well as variations in alter resources. Survival was operationalized as the persistence of the SME into 2015 from 2014. Data was collected from a poultry cluster in rural mid-western Ghana that is one of the best performing in the country as a critical case (Flyvbjerg 2006; FAO 2014) in order to avoid network sprawl and sparseness (Hanneman and Riddle 2005). Data modelled with a cross-sectional probit model with lagged independent variables while controlling for the SME characteristics, owner characteristics, and organizational competencies. The reported results are the average marginal estimates from the probit models.

Table 2.   Probit survival models.

DV: SME survival	**(1)**	**(2)**	**(3)**	**(4)**
Age of SME	0.003	0.004	0.006	0.003
	(0.005)	(0.006)	(0.004)	(0.005)
Size of SME	0.018**	0.013*	0.013*	0.015*
	(0.008)	(0.007)	(0.007)	(0.009)
Generalist	−0.286***	−0.218***	−0.290***	−0.279***
	(0.043)	(0.036)	(0.042)	(0.038)
Education (>Primary = 1)	0.015	0.017	0.015	0.005
	(0.048)	(0.037)	(0.043)	(0.049)
Owner experience	0.010**	0.009**	0.014**	0.010**
	(0.005)	(0.004)	(0.006)	(0.005)
Male	−0.152***	−0.116***	−0.192***	−0.170***
	(0.048)	(0.043)	(0.071)	(0.057)
Technical competence	0.074***	0.040**	0.070***	0.073***
	(0.021)	(0.017)	(0.023)	(0.019)
Entrepreneurial orientation	0.094***	0.102***	0.122***	0.103***
	(0.030)	(0.024)	(0.027)	(0.027)
Market orientation	0.024	0.039**	0.051	0.025
	(0.025)	(0.019)	(0.032)	(0.027)
Dynamic capability	0.025	0.011	0.003	0.015
	(0.029)	(0.021)	(0.029)	(0.028)
Absorptive capacity	0.101***	0.114***	0.147***	0.111***
	(0.029)	(0.026)	(0.045)	(0.031)
Investment climate constraints	−0.268***	−0.262***	−0.340***	−0.261***
	(0.040)	(0.043)	(0.072)	(0.042)
Direct resources		0.081***		
		(0.022)		
Indirect resources		0.011**		
		(0.005)		
Market resources (MR)			0.032**	
			(0.015)	
Variation in alter MRs			0.036	
			(0.035)	
Technological resources (TR)				0.020*
				(0.012)
Variation in alter TRs				−0.012
				(0.030)
Wald	36.07***	74.46***	18.06	30.18***
Pseudo R^2	0.733	0.821	0.777	0.745
Observations	155	155	155	155
Robust standard errors in parentheses				

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

We found that alter resources are generally useful for the survival probability of SMEs. This is because SMEs can reap greater benefits from external collaborations as it can compensate for the scarcity of internal resources and competences. This means that SMEs can appropriate the market and technological resources of its alters for survival. These market resources enable the SME to better determine and satisfy the needs and wants of target markets, as well as deal with inherent threats while maximizing the benefits that may arise in such markets (Mahmoud and Yusif 2012; Cambra-Fierro et al. 2011). Technological resources also offer the opportunity for SMEs to expand quickly and efficiently by serving as an enabler of production and service functions of the business (Aa and Elfring 2002). However, market resources have a stronger effect on survival than technological resources. This may be a purely contextual matter since the operations of most SMEs in Ghana are labor intensive and require little sophisticated technology (Kayanula and Quartey 2000). Again, this may be due to the fact that agricultural produce in many rural parts of Ghana does not reach many market centers due to poor road infrastructure (Buame 1996) and a general lack of access to markets (FAO 2014). We also observed that the variations in the resources received from alters had no significant effect on survival. However, the directions of their effects are informative. High variations in alter market resources have a positive effect, while those of technological resources have a negative effect. This goes to support the point that high variations in alter technological resources can have a negative effect as uncertainty creeps in to create doubt and hence the SME may not be able to benefit from technological resources while the risk of choosing the wrong technology is high (Rogers 2010).

We found that the mechanism through which the resources diffuse matters for the survival. Both the direct and indirect tie mechanisms have a positive effect on the survival of the SME. The effect of direct ties work through complementarities, knowledge sharing, and scaling of activities of SMEs that directly collaborate with each other in the network (Ahuja 2000). Indirect ties may work because they present arm's length relations that require little investment (Uzzi and Lancaster 2003) and this helps SMEs gain access to resources beyond their local neighborhood and avoid informational and resource redundancy-related problems (Burt 2005). The direct tie mechanism has a bigger coefficient compared to the indirect ties.

5.1. Implications for practice

We now discuss the implications of the results for enterprise management and research. We suggest to managers of small business to explore collaborations with their alters as these provide a mechanism through which they can access resources to mitigate their own scarcity in resources and competences. These can come in the form of knowledge sharing, complementarities, and scaling opportunities. Second, they need to be wary of significant variations in alter technological resources as these can have a negative effect on their survival chances. This is because wrong technological choices can prove costly in production down times, especially when high variations in alter technological approaches defeat the assumption that alter ties should help SMEs reduce their uncertainty in such situations (Rogers 2010). Finally, they need to look beyond their immediate neighborhoods in the network as resources embedded with indirect ties represent resources with little constraints and provide the 'vision advantage' required to be innovative.

6.   Conclusion, limitations, and further research directions

The aim of this study was to come to grips with the usefulness of alter resources for SME survival in Ghana. We found that alter market resources and technological resources are significant for the survival of SMEs. Thus, for SMEs to survive in today's competitive business environment, market resources and technological resources are very much needed. Ultimately, the way in which SMEs combine and use both technological and market resources cannot be underestimated if they seek to survive. We also explored the effect of variations in alter competences along the lines of the resource and found that market resource variations have a positive effect and technological resource variations have a negative effect; however, these do not rise to significance. Finally, we assessed the impact of the mechanism through which the resources are diffused and found that both direct and indirect tie mechanisms have a positive effect on survival, although the effect of direct ties was greater than that of indirect ties. Thus, the direct and indirect mechanisms through which the resources reach SMEs are both associated with positive outcomes.

While the study makes modest contributions to the literature on distribution ties and survival in small agricultural firms in Ghana's emerging economy, it is relevant to point out some limitations which are associated with the current study and some research directions. First, the model used for this study was only applied to SME survival. Further studies can apply this framework to other enterprise or organizational outcomes such as performance or innovation. This paper utilizes an agricultural (poultry sector) data-set to test the study hypotheses. Other studies can test these hypotheses in other industrial sectors in Ghana, such as services and manufacturing sectors. Again, the authors utilized the Dormaa poultry cluster in Ghana. Other studies could be replicated within the poultry industry in other clusters in Ghana or other African countries. These could form the basis of strong validation and replication studies to establish the robustness of the study findings, and determine if they are context-driven.

It is fair to mention that studies of enterprise survival usually rely on data on entry decisions of firms from longer range of years, usually spanning five years and beyond especially in organizational ecological analysis (see Acheampong, Narteh, and Rand 2017). However, data constraints have forced many studies in Africa to rely on shorter ranges (see Ali and Peerlings 2012, for example). This paper is also no different in this respect. However, future studies can build on this study and collect panel data based on this two-year panel utilized in this study.

Another limitation of this study relates to the variables contained in the research model. Inasmuch as the research model encompasses the variables that are central to the current study and its objectives, there are a number of possible components/variables that could also explain and affect the relationship between the fundamental constructs used in the study. Nevertheless, the theoretical principles guiding the tentative approaches help to minimize these limitations were employed in this paper to help enhance the generalizability of the research results as much as practicable.

We use degree and eigenvector centrality-adapted measures as our tools in measuring diffusion; however, new approaches are emerging that can handle specifically diffusion-based issues in networks albeit with some data constraints (Jackson 2010). Also, we focus on a critical case in Ghana. Replications of this study can take place in other jurisdictions to attempt a falsification of our findings. This will provide the needed stress test of our approach and findings.

Disclosure statement

No potential conflict of interest was reported by the authors.

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Notes

1. Businesses employing less than 99 employees in Ghana.
2. Based on FAO 1-2-3 Classification.

Notes on Contributors

George Acheampong holds a PhD from the University of Ghana after completing coursework at the University of Copenhagen. George is a past DANIDA Growth and Employment Scholar. He has held fellowships at the UNU-WIDER and DERG University of Copenhagen. His research interests are in how enterprise can lead to development in Africa utilizing market-based approaches. George teaches entrepreneurship, international business and marketing at the University of Ghana Business School. He is a member of the following professional bodies: The Academy of Management (AoM) Entrepreneurship Division, Africa Academy of Management (AFAM), International Academy of African Business and Development (IAABD), Development Economics Research Group (DERG-UCPH) and International Network of Social Network Analysts (INSNA).

Robert Ebo Hinson is a professor and a past Head of the Department of Marketing & Entrepreneurship at the University of Ghana Business School. Prof Hinson has a keen interest in research and in recognition of his research productivity, was awarded the 2008 Emerati Highly Commended paper Award for a co-authored paper published in Corporate Governance, the 2009 Journal of African Business Best Paper Award, the 2010 Emerati Outstanding paper Award for a co-authored paper published in the Journal of Research in Interactive Marketing and the Best Paper award in the International marketing track at the 2010 Academy of Marketing Conference at the Coventry University Business School, for another co-authored paper. His current areas of research are services management, e-business, marketing practice, corporate social responsibility (CSR) and international business. Robert holds two doctorate degrees; one in Marketing from the University of Ghana; and a second in International Business from Aalborg University in Denmark.

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Appendix

Table A1.   Correlation matrix.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
SME survival	1																		
Direct alter resources	0.3	1																	
Indirect alter resources	0.4	0.7	1																
Alter market resources	0.4	0.2	0.2	1															
Variation in alter MRs	0.3	0.6	0.5	0.3	1														
Alter technical resources	0.3	0.2	0.3	0.7	0.2	1													
Variation in alter TRs	0.3	0.6	0.6	0.3	0.8	0.3	1												
Age of SME	0.2	0.3	0.3	0.0	0.3	0.2	0.2	1											
Size of SME	0.2	0.8	0.6	0.1	0.5	0.2	0.4	0.4	1										
Generalist	−0.5	−0.2	−0.2	−0.3	−0.2	−0.3	−0.2	−0.2	−0.2	1									
Education (>Primary = 1)	−0.2	0.2	0.0	0.0	0.1	0.0	0.0	0.1	0.2	0.1	1								
Owner experience	0.3	0.2	0.3	0.1	0.3	0.3	0.3	0.6	0.3	−0.3	−0.1	1							
Male	0.1	−0.1	−0.1	0.1	−0.1	0.1	0.0	0.1	0.0	−0.1	−0.1	0.3	1						
Technical competence	0.2	0.2	0.2	0.0	0.0	0.1	0.0	0.2	0.2	0.0	0.0	0.2	0.0	1					
Entrepreneurial orientation	0.5	0.3	0.5	0.2	0.3	0.1	0.3	0.1	0.4	−0.3	−0.2	0.3	0.1	0.0	1				
Market orientation	0.4	0.0	0.2	0.1	0.1	0.2	0.1	0.0	0.1	−0.2	−0.2	0.2	0.2	−0.1	0.5	1			
Dynamic capability	0.6	0.2	0.4	0.4	0.2	0.3	0.2	0.1	0.3	−0.3	−0.2	0.3	0.1	0.2	0.6	0.5	1		
Absorptive capacity	0.4	0.3	0.4	0.2	0.3	0.2	0.2	0.2	0.3	−0.2	−0.1	0.2	0.1	0.1	0.6	0.5	0.6	1	
Investment climate constraints	−0.5	0.1	−0.1	−0.3	0.0	−0.3	−0.1	0.1	0.2	0.2	0.3	−0.2	−0.2	−0.1	−0.2	−0.3	−0.3	−0.1	1