



Original article

Business networks, regulation and local content in Tanzania's oil and gas sector

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ABSTRACT

Free market advocates doubt the ability of industrial regulation to make oil and gas companies adopt local content practices. This study explores this position by assessing the effects of industrial regulations on business networks. Using data collected from a survey of 191 senior practitioners in the oil and gas industry in Tanzania and analysed using the PROCESS tool for moderating effect, the study shows that the continuity, complexity, cooperation, socialisation and formalisation of business networks all have significant positive effects on local content practice. At the same time, however, conflict has a significant negative effect on local content practice. The findings indicate that the interactions of industrial regulation with continuity, complexity, conflict and cooperation significantly reduce local content practices, while for interdependence, informality, adaptation, socialisation and formalisation the results are not significant. As such, this study implies that host countries should not exclusively depend on industrial regulation to achieve national objectives around local content. Policy formulation should take into account the business interconnectedness of oil and gas companies because local content practices are not only affected by industrial regulation but also by companies' respective business networks.

1. Introduction

In Tanzania, oil and gas exploration has taken place since 1952. The first natural gas discovery was made in 1974, and by 2016, about 57 trillion cubic feet in reserves had been discovered (URT, 2017). However, exploration has so far been conducted in less than half of the potentially oil and gas rich areas of the country (URT, 2017). Moreover, despite the on-going exploration, most of the natural gas discovered has not yet been developed (URT, 2017). The government reports that there is also a chance of discovering oil (Bishoge et al., 2018). In either case, to develop these reserves efficiently, specific services will be needed (Tordo et al., 2013; Warner, 2011). Globally, oil and gas companies spend trillions of dollars outsourcing these oilfield services to reliable international suppliers (Graham and Ovidia, 2019; Hilson and Ovidia, 2020; Warner, 2011). But the tendency to source from familiar suppliers in existing business networks has been found to impede local content practices (Ngoasong, 2014; Nwosu et al., 2006; Tordo et al., 2013).

Business networks have both structural and functional characteristics: the former include continuity, complexity, interdependence and informality while the latter include adaptation, conflict, cooperation,

socialisation and formalisation. Normally, the structural and functional characteristics of business networks confine the practices of parties therein within relational needs. Thus, in a stable network, a buyer will always source from similar suppliers in the network (Balasingham, 2013; Gadde and Snehota, 2000; Håkansson and Snehota, 1995). It is therefore unlikely that local economic sectors will benefit much from the trillions of dollars spent to procure oilfield services (Esteves et al., 2013; Tordo et al., 2013; URT, 2015). This view is also supported by the Industrial Marketing and Purchasing (IMP) perspective (Håkansson and Snehota, 1995).

Recognising the limited involvement of domestic-based parties providing goods and services, the Government of Tanzania proposed different measures to improve participation of local suppliers in the oil and gas industry, including the use of open tenders by oil and gas companies (Barlow, 2020; Nuhu et al., 2020; URT, 2015). Its policy called for adjustments to be made to the usual open tender approach to favour local suppliers, including relaxing evaluation criteria in the areas of firm experience and performance bonds (URT, 2015; Warner, 2011). Additionally, the measures emphasise the need to create awareness amongst local suppliers of the opportunities available to supply to the oil

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and gas industry, as well as establishing a payment scheme that suits the financial capacity of local suppliers (Heum, 2008). It has been observed that most oil and gas companies internationally are reluctant to endorse such mechanisms (Ngoasong, 2014; Nwosu et al., 2006; Tordo et al., 2013). To address this challenge, most developing countries with oil and gas industries enact legislation and regulations aimed at enforcing the adoption of the proposed sourcing practices (Scurfield et al., 2017; URT, 2017)

In Tanzania, the proposed regulatory measures require oil and gas companies to assess and report to the regulator the state of engagement with the proposed local content practice. The report must be submitted quarterly, semi-annually or annually, depending on the nature of the policy issue (URT, 2017). Critics of this hardline approach argue that there are some issues and potential contradictions in the regulations that need to be addressed (Esteves et al., 2013; Kinyondo and Villanger, 2017; Scurfield et al., 2017). For example, there is a concern that this approach runs counter to World Trade Organisation (WTO) regulations. One alternative approach proposed, perceived to be much softer by critics, is for sourcing practice not being a mandatory requirement but should provide an opportunity for companies to determine their use based on the market situation (Scurfield et al., 2017). Imposed policies and regulations have also been criticised for their inconsistent use of terms, and for the lack of a common understanding amongst various stakeholders. Moreover, studies have observed a low level of involvement by key actors, such as oil and gas companies, in developing local suppliers (Calignano and Vaaland, 2018; Kinyondo and Villanger, 2017).

Although the use of a hard approach in implementing local content requirements by developing countries rich in natural resources is seen as working against the philosophy of a free market economy (Freeman and Dmytriiev, 2017), it is often argued that governments should impose industrial regulations where they are deemed appropriate (e.g. in ameliorating market failure in favour of local communities) (Joskow and Noll, 1981; Posner, 1974; Stigler, 1971). Support for this view is found within economic regulation theories which argue that imposing industrial regulation without proven market failure may produce an adverse effect (Joskow and Rose, 1989). In this study, we argue that critical analysis of the effect of industrial regulation should be made prior to its imposition (Joskow and Noll, 1981). It is important to examine the effect of industrial regulation through an interactive approach in which the characteristics of existing business networks are considered as key factors in determining the outcome variable while industrial regulation is considered as the moderating variable (Joskow and Rose, 1989; Joskow and Noll, 1981). To the best of our knowledge, no empirical study of this nature has been conducted to date.

A review of previous studies (Acheampong et al., 2016; Adedeji et al., 2016; Adomako and Danso, 2014) shows that, contrary to theories of economic regulation (Joskow and Noll, 1981; Posner, 1974; Stigler, 1971), attempts have been made to examine the effect of industrial regulation as a predictor and not as a moderating variable. Furthermore, business networks, which have been found to impede local content practices, have not been taken into consideration during these analyses (Adomako and Danso, 2014; Arthur and Arthur, 2016b; Ngoasong, 2014). Ignoring the influence of business network characteristics can lead to inappropriate decisions to impose industrial regulation (Joskow and Rose, 1989). With this in mind, the study was designed to use an interactive approach, assessing the moderating effect of industrial regulation on local content practices by taking business network characteristics as key factors (Owusu and Vaaland, 2016; Vaaland et al., 2012). Earlier case studies (Arthur and Arthur, 2016a; Ngoasong, 2014; Nwosu et al., 2006; Tordo et al., 2013) consistently found that business networks hinder local content practices in oil and gas companies, but their findings were not empirically supported. This study therefore uses a survey method to examine the effect of business network characteristics on local content practices while taking industrial regulation as a moderating variable in oil and gas companies operating in Tanzania.

2. Theoretical perspectives and empirical studies

This study is informed by two major theories, IMP and the theory of economic regulation. In the former, the buyer–supplier relationship is seen as the simplest form of business network (Håkansson and Shenota, 1995). The relationship between buyer and supplier is assumed to have structural and functional characteristics: structural characteristics include continuity, complexity, interdependence and informality, while functional characteristics include adaptation, conflict, cooperation, socialisation and formalisation (Håkansson and Shenota, 1995). IMP further assumes that business network characteristics will normally create network stability, leading to the intention to continue the relationship (Håkansson and Shenota, 1995). This means that, in a stable network, buyers will always use direct selection or the single source method to source their requirements from familiar suppliers in the network (Chakraborty and Philip, 1996).

However, empirical studies such as Bobot (2011) have found that business network characteristics do not always guarantee stability of the network. For example, dysfunctional conflicts can occur which destabilize the network, forcing buyers to look for alternative sources outside the network. Furthermore, the existence of a network does not always increase the performance of individual actors. Thus, network failure may reduce an actor's commitment to future interactions (Kim, 2014). Studies also suggest that buyers may solicit from outside the network as a strategy for developing the supply base in the network (Chakraborty and Philip, 1996) or in order to reduce the power of key suppliers in the network (Balasingham, 2013). Therefore, there are certain circumstances in which buyers may use an open tender method to look beyond the business network.

While IMP theory confines itself to explaining buyer–supplier relationships (Balasingham, 2013; Chakraborty and Philip, 1996; Håkansson and Shenota, 1995) it is clear that there are other relevant actors, including governments, local communities and financiers (Freeman and Dmytriiev, 2017; Pfeffer, 1987), who interact with buyers in the network. Moreover, IMP does not explain, for example, how the buyer's network with a supplier reacts to new market constraints, such as local content requirements and industrial regulation, which may be imposed by the host country. This is not surprising, considering its basic belief in the free-market economy and its assumption that network actors (buyer and supplier) do not shift from one country to another in search of resources (Håkansson and Shenota, 1995).

Economic regulation theory, on the other hand, focuses on issues of the regulated market not covered by IMP theory. According to economic regulation theory, industrial regulation will always moderate the behaviour of business entities irrespective of the situation of the business networks (Posner, 1974; Stigler, 1971). However, this theory has very little to say about the behaviour of business networks. Furthermore, it suggests that, in the public interest model, the decision to impose industrial regulation should be justified by the existence of market failure (Joskow and Noll, 1981). A study by Joskow and Rose (1989) proposes that assessment of the effect of industrial regulation should take into account the interactive nature of other factors relevant to the outcome of the policy. This is consistent with other studies (Posner, 1974; Stigler, 1971) suggesting that industrial regulation should be examined as a moderating variable and not as a predictor. It is important to consider the influence of other market forces that predict the outcome variable.

However, this is not the practice adopted in most empirical studies examining the effect of industrial regulation. The majority of such studies (e.g., Acheampong et al., 2016; Adedeji et al., 2016; Adomako and Danso, 2014) examine industrial regulation as a predictor of the outcome and not as a moderator. These studies have produced inconsistent findings which cannot guide host governments on policy formulation with regard to local content practices in oil and gas. Given the inclination of governments to impose industrial regulation to enforce the adoption of local content practices, and the allegation that business networks with key suppliers tend to impede the adoption of such

practices in oil and gas companies, there is a need to articulate empirically the effects of interaction between business network characteristics and industrial regulation.

3. Hypotheses development

3.1. Structural characteristics and moderating effect of industrial regulation

As noted earlier, the IMP perspective considers the structural characteristics of the buyer–supplier relationship as consisting of four important components, namely continuity, complexity, interdependence and informality (Håkansson and Shenota, 1995). It is assumed that these will stimulate network stability and the intention of the buyer to continue the exchange relationship with the supplier (Gadde and Snehota, 2000). However, a number of studies have indicated that this is not always the case (Bobot, 2011; Chakraborty and Philip, 1996; Kim, 2014). For example, Kim (2014) shows that the buyer may be satisfied with the supplier but may not necessarily commit to future interaction.

With respect to continuity, it is argued that the buyer's intention to source from familiar suppliers in the network is likely to reduce adherence to local content practices. However, if the buyer can engage in local content practices despite the intention to continue with the existing relationship with familiar suppliers, then imposing industrial regulation may not have any significant effect—the implication being that there is no market failure justifying the use of enforced measures (Joskow and Rose, 1989). On the other hand, if the buyer has no intention of providing an opportunity to local suppliers due to on-going business ties with international suppliers, then imposing industrial regulation is justified and may have a significant effect on local content practices (Acheampong et al., 2016; Joskow and Noll, 1981). This study, therefore, hypothesises that:

H_{1a} Continuity has a significant effect on local content practice.

H_{1b} Interaction between the continuity of business networks and industrial regulation has a significant effect on local content practice in oil and gas companies.

The complexity of relationships makes it expensive to maintain business networks due to the coordination costs incurred in order to avoid conflict (Lacam et al., 2017; Meepetchdee and Shah, 2007). Depending on the level of complexity, buyers may therefore engage in local content practices to develop locally based suppliers in a bid to avoid unnecessary costs and build on-going relationships. This is because buyer might not have committed to the international supplier due to complexity of relationship (Håkansson and Shenota, 1995; Ritter et al., 2004). Therefore, this study argues that, if the complexity of the relationship can reliably predict the local content practices in the oil and gas companies, then imposing industrial regulation may produce a negative effect on those practices. Note, however, that this assumption depends on the level of complexity of the relationship and the extent to which it creates conflicts and raises relational costs due to coordination. This study, therefore, further hypothesises that:

H_{2a} Complexity has a significant effect on local content practice.

H_{2b} Interaction between the complexity of business networks and industrial regulation has a significant effect on local content practice in oil and gas companies.

The third structural characteristic, interdependence, is usually built on issues such as the lack of a substitute and switching costs (Caniëls and Gelderman, 2007; Kumar et al., 1995; Turner et al., 2000). This in turn binds together buyers and suppliers, and is normally associated with buyers' fear of losing suppliers, which prevents them from engaging in local content practices, including developing locally based suppliers for oilfield services. In terms of economic regulation theory (Joskow and

Rose, 1989), it is argued that if the degree of interdependence is low, such that buyers may provide opportunities to local suppliers in the absence of industrial regulation, then the imposition of regulation is likely to produce a negative effect. This study hypothesises that:

H_{3a} Interdependence has a significant effect on local content practice.

H_{3b} Interaction between interdependence in business networks and industrial regulation has a significant effect on local content practice in oil and gas companies.

Finally, informality signifies the presence of trust in the relationship between buyers and suppliers (Doney and Cannon, 1997; Marlow et al., 2010). Trust induces a commitment to future interaction (Frazier et al., 1994; Frazier et al., 2017): buyers' engagement in local content practices is thus contingent on their levels of trust in the supplier. It is therefore argued that the effect of industrial regulation to induce buyers to engage in local content practices is similarly contingent on the effect of informality on the local content practice. This study, therefore, hypothesises that:

H_{4a} Informality has a significant effect on local content practice.

H_{4b} Interaction between informality in business networks and industrial regulation has a significant effect on local content practice in oil and gas companies.

3.2. Functional characteristics and moderating effect of industrial regulation

As already noted, the functional characteristics of business network comprise different elements such as adaptation, conflict, cooperation, socialisation and formalisation (Håkansson and Snehota, 1995). The IMP perspective assumes that functional characteristics usually create network stability and enhance the intention to continue in the exchange relationship between buyer and supplier (Håkansson and Snehota, 1995). However, some empirical evidence suggests that there are circumstances where they may fail to create stability in a network, for example where a supplier is not consistent in meeting the buyer's expectations (Gadde and Snehota, 2000) or in the case of dysfunctional conflicts (Bobot, 2011; Bradford et al., 2004). Functional conflicts are considered necessary for the growth of business relationships while dysfunctional ones tend to break those relationships (Bobot, 2011; Håkansson and Snehota, 1995).

Freeman and Dmytriiev (2017) suggest that a buyer may seek suppliers from outside its network in order to fulfil its responsibility to the local community. Alternatively, sourcing from local suppliers may be an opportunity for a buyer to shed high transactional costs (Esteves et al., 2013; Warner, 2011). This study therefore argues that the extent to which suppliers and buyers accept requests for changes pertaining to stockholding policy, quality specification and business practices shows the intention to continue in the business relationship (Balasingham, 2013; Hallen et al., 1991; Medlin, 2004). Put differently, buyers' engagement in local content practices depends on the extent to which both the supplier and the buyer are willing to adjust to meet the needs of the relationship. Thus, this study posits that the effect of industrial regulation to induce buyers to engage in local content practices depends on whether adaptation has a positive relationship with local content practice, or not. However, such a positive relationship will only be possible if the supplier is able to adjust and fit into the relationship in a way that enables the buyer to provide opportunities to local suppliers, thus resulting in the industrial regulation having non-significant effects. This study, therefore, hypothesises that:

H_{5a} Adaptation has a significant effect on local content practice

H_{5b} Interaction between adaptation in business networks and industrial regulation has a significant effect on local content practice in oil and gas companies.

Disagreement within buyer–supplier relationships is a regular phenomenon that can determine the growth or failure of a relationship (Bobot, 2011; Håkansson and Snehota, 1995). Buyers' decisions to engage in local content practices depend on whether conflicts in their ongoing relationships with suppliers are functional or dysfunctional (Bobot, 2011). As already noted, functional conflicts are necessary for the growth of business relationships (Bobot, 2011; Håkansson and Snehota, 1995). This implies that, where there are dysfunctional conflicts, buyers will provide opportunities to local suppliers; in that case, imposition of industrial regulation is not justified and may have a non-significant effect on the local content practice (Joskow and Rose, 1989). Conversely, if there are functional conflicts such that existing relationships are flourishing, buyers may not provide opportunities to local suppliers. In this case, imposition of industrial regulation is justified and may have a significant effect on local content practices. It is therefore hypothesised that:

H_{6a} Conflict has a significant effect on local content practice.

H_{6b} Interaction between conflict in business networks and industrial regulation has a significant effect on local content practice in oil and gas companies.

Cooperation eases differences in goals through resource munificence, leading to stability and commitment for future interaction (Cai and Yang, 2008; Grandinetti, 2017; Holm et al., 2015; Holm et al., 1996; Zhuang et al., 2010). Buyers' decisions to engage in local content practices therefore depend on the level of cooperation in their ongoing relationships with international suppliers. If the latter are sufficiently cooperative, buyers may not engage in local content practice and imposing industrial regulation may be justified. However, if suppliers are not cooperative, then buyers will automatically consider providing opportunities to local suppliers instead, meaning that imposing industrial regulation is not justified and may have no significant effect. This study hypothesises that:

H_{7a} Cooperation has a significant effect on local content practice.

H_{7b} Interaction between cooperation in business networks and industrial regulation has a significant effect on local content practice in oil and gas companies.

Socialisation between buyers and suppliers develops trust through information sharing and familiarisation (Cousins et al., 2008; Kulangara et al., 2016; Lawson et al., 2009; Shi and Dana, 2013). Socialisation leads to stability and the continuation of the relationship (Håkansson and Snehota, 1995). Therefore, buyers' engagement with local content practices is affected by the level of socialisation with suppliers in ongoing relationships. This implies that, where there is inadequate socialisation, the buyer will automatically switch to local suppliers: imposing industrial regulation is not justified and may have no significant effect. Alternatively, where there is high degree of socialisation, buyers may not consider sourcing from local suppliers due to an absence of trust: in that case the use of industrial regulation may be justifiable and may have a significant effect. The study, therefore, hypothesises that:

H_{8a} Socialisation has a significant effect on local content practice.

H_{8b} Interaction between socialisation in business networks and industrial regulation has a significant effect on local content practice in oil and gas companies.

Finally, formalisation controls the practices of buyers and suppliers to reduce the risk of conflict arising from opportunistic behaviour

(Guercini and Tunisini, 2017; Marlow et al., 2010; Williams and Round, 2007). A degree of formalisation stabilises relationships and leads to a commitment to future interaction (Håkansson and Snehota, 1995). However, a high level of formalisation may reduce flexibility and innovation while increasing the chance of conflicts; this may reduce the buyer's intention to continue the relationship (Ohlyet al., 2006; Tripathi et al., 2018). When there is a high level of formalisation, therefore, buyers are more likely to end their relationship with international suppliers and consider shifting to local suppliers instead. On the other hand, if formalisation is light, the relationship with international suppliers will be stable, meaning that buyers are less likely to consider giving opportunities to local suppliers. Imposing industrial regulation may therefore be justified. This leads to the study hypothesis that:

H_{9a} Formalisation has a significant effect on local content practice.

H_{9b} Interaction between formalisation in business networks and industrial regulation has a significant effect on local content practice in oil and gas companies.

4. Study methods

The study used primary data, which included views solicited from respondents working in the oil and gas companies. The conceptualisation and operationalization of variables were adapted from prior studies, as indicated in Appendix A. The variables used in inferential analysis were measured using a 5-point Likert scale from 1 (meaning strongly disagree) to 5 (meaning strongly agree). The use of the 5-point Likert scale was considered relevant to enhance precision and reduce measurement error (Cooper et al., 2006; Kothari, 2004). Multiple items were used to capture each construct to ensure validity since there was no consensus about the precise measurements for the study constructs (Brahma, 2009). For example, continuity was measured by considering the length of relationship, repeat purchase, supplier competence and commitment to future interaction (Anderson and Weitz, 1989; Håkansson and Snehota, 1995; Morgan and Hunt, 1994). Respondents were sampled from a group of employees working in middle and senior management positions identified through adhoc interviews during the questionnaire development stage, consistent with the approach suggested by (Cooper et al., 2006). A simple random sampling technique was used to identify respondents, while a standard questionnaire was used to collect the data; the questionnaires were self-administered by respondents.

Questionnaires were distributed and collected by setting appointments with respondents; mobile phones were used to facilitate the collection, and also proved to be useful during the follow-up exercise to ensure a high level of response. These approaches were adopted to ensure that data were obtained from the right respondents while reducing bias and enhancing study objectivity and independence (Leong, 2014; Scotland, 2012). The study covered a total sample of 191, as indicated in Table 1.

Various approaches such as the use of clear language, providing sub-headings in the research instrument to guide the respondents, the use of multi-dimensional perspectives and multiple items measurements, as well as summated scale and bootstrap techniques, were used to handle any possible measurement errors, including non-response bias (Field, 2013; Hair et al., 2009; Singh and Xie, 2010). Principle Component Analysis (PCA) was conducted to reduce data range and establish the convergent and divergent validity of the measurement (Field, 2013; Hair et al., 2009). A descriptive analysis of the participants' responses was conducted to examine the credibility of the data based on the respondents' profiles (Muijs, 2010). Finally, inferential analysis was used to test the study's hypotheses (Field, 2013; Hair et al., 2009). This included the use of the PROCESS tool (Hayes, 2013) to examine the interactive effect and regression analysis. To test the hypotheses, the study developed 11 models as presented in Appendix C.

Table 1
Descriptive Statistics for the Respondents' Profiles.

Type	Profile	(<i>F</i> , <i>n</i> = 191)	%
Gender	Male	147	77
	Female	44	23
Position	Director	2	1
	Manager	39	20.4
	Officer	114	59.7
	Other Staff (Field Technicians)	36	18.9
Education	High School	21	11
	Bachelor's Degree	117	61.3
	Master's Degree	43	22.5
	Doctorate (PhD)	2	1
	Other	8	4.2
Knowledge of Business Networks	Below Average	5	2.6
	Average	113	59.2
	Above Average	73	38.2
Knowledge of Local Content Practices	Below Average	12	6.3
	Average	125	65.4
	Above Average	54	28.3
Experience	Less than a year	16	8.4
	Between 1 and 3 years	40	20.9
	Between 3 and 5 years	63	33
	More than 5 years	71	37.7
Nationality	Tanzanian by Birth	182	95.3
	Asian	4	2.1
	Non-Tanzania but African	1	0.5
	North American	4	2.1
Company Attribute	Oil and Gas Exploration	112	58.6
	Oil and Gas Processing and Distribution	79	41.4

5. Study results

5.1. Descriptive results

Table 1 provides respondents' profiles with regard to gender, job position, education level, knowledge of business networks and local content issues, experience, nationality and company's attributes. The respondents' profiles are important for inferential statistics because they provide details about the respondents' characteristics, which are useful for building confidence in the findings (Babin and Anderson, 2014; Field, 2013). The descriptive statistics (Table 1) describe a total of 191 respondents. All of the respondents possessed sufficient knowledge about the study variables and had at least moderate experience in their positions, the majority having been in post for a year or more. Of the 191 respondents, 58.6% represented oil and gas companies undertaking exploration activities, while 41.4% represented companies involved in the processing and distribution of natural gas. Therefore, respondents' profiles were sufficiently rich to build confidence that the findings correctly reflected the reality of the population and the context.

5.2. Inferential results

5.2.1. Reliability and validity tests

To ensure quality of inferential results, the study included a number of tests, namely PCA, Variance Inflation Factor (VIF) and correlation analysis. PCA was conducted to reduce data range while ensuring validity of the measurements. VIF and correlation analysis were conducted to ensure the absence of multicollinearity. This study used a total of nine characteristics of business networks (Håkansson and Snehota, 1995): the four structural characteristics — Continuity (CN), Complexity (CT), Interdependence (IT) and Informality (IF) — and the five functional characteristics — Adaptation (AD), Conflict (CF), Cooperation (CP), Socialisation (SC) and Formalisation (FM). Since multi-dimensional perspectives and multiple items were used to measure the constructs, PCA was conducted to reduce data sets while ensuring the validity and

reliability of the measurements (Field, 2013). Both convergent and divergent validity as well as multicollinearity were examined for modelling purposes (Hair et al., 2009). This ensured that each model constituted unique information which was not available in other models. A correlation matrix, communalities and a rotated matrix (see Appendix B and Table 2), as well as VIF and tolerance coefficients, were used for this purpose (Babin and Anderson, 2014; Field, 2013; Singh, 2007). The aim of assessing multicollinearity was to ensure that no perfect correlation existed between the independent variables (Singh, 2007).

Ensuring that there is 0% multicollinearity can result in a final regression model that achieves the highest level of predictive accuracy, but which has little managerial relevance (Babin and Anderson, 2014). In this study, variables with a correlation coefficient of 0.8 or more were considered perfectly correlated (Field, 2013). However, the assessment revealed that the independent variables were not perfectly correlated, as all of the predictors had a coefficient < 0.8 while the VIF and tolerance coefficients were < 10 and > 0.2, respectively. From this, it was assumed that there is no significant multicollinearity problem. Furthermore, the reliability of the measurement for checking its consistency was tested using Cronbach alpha (Table 2). The results indicated that all of them were above 0.7 and, in case of VIF; results indicated that all of the variables were less than 3. All these results indicate that there is no problem of multicollinearity. Factor extraction was also carried out, based on eigenvalues > 1, KMO > 0.5 and total variance explained > 60% (Field, 2013). Communality was set at 0.6, while items cross-loaded to more than 1 factor were excluded from the data set (Hair et al., 2009).

5.2.2. Structural characteristics and local content practices

The results from multiple linear regressions Model 1 (Table 3) show that the coefficient of determination (R-Square) is 0.104, which means that the structural characteristics of business relationships with key suppliers explain about 10% of the total variance in Local Content Practice (LCP). The adjusted R-Square is 0.085, which is just below the coefficient of determination, thereby indicating that the prediction model is stable. The F-value is 5.384 and p-value for the model is < 0.05, which means that the prediction model is optimal. The results show that continuity (CN) has a significant effect on LCP. The relevant hypothesis is thus statistically supported with $t = 2.536$, $p < 0.05$, while other hypotheses, related to the significance of complexity (CT), interdependence (IT) and informality (IF) on LCP, were not statistically supported.

5.2.3. Functional characteristics and local content practices

The results from multiple linear regressions Model 2 (Table 4) show that the coefficient of determination (R-Square) is 0.210. This means that the functional characteristics of business relationships with key suppliers explain about 21% of the total variance of local content practice. The adjusted R-Square is 0.191, which is just below the coefficient of determination, which indicates that the prediction model is stable. The F-value is 9.997 and the p value for the model is < 0.05, which means that the prediction model is optimal. The empirical results show that hypotheses relating to conflict (CF), cooperation (CP) and socialisation (SC) have significant positive effects on LCP — they are statistically supported. For the hypotheses on adaptation (AD) and formalisation (FM), these appear to have no significant effect on LCP and thus are not statistically supported.

5.2.4. Moderating effect of industrial regulation

The effect of using enforced measures on local content practice was examined using the PROCESS tool (Hayes, 2013) in the SPSS 23 software. Regression Model 2 was developed, with the nine characteristics of business networks (Håkansson and Snehota, 1995) being analysed as predictors of the outcome variable, which was local content practice (LCP). The moderating variable was Industrial Regulation (IR) and it was centred between each predictor and the outcome variable, as shown in the models. The results showing the interaction coefficients are

Table 2
Correlation Matrix.

	CN	CT	IT	IF	AD	CF	CP	SC	FM	Tolerance	VIF	Reliability
CN	1.000									0.594	1.684	0.822
CT	0.605**	1.000								0.495	2.022	0.823
IT	0.359**	0.400**	1.000							0.694	1.441	0.836
IF	0.392**	0.504**	0.289**	1.000						0.561	1.783	0.883
AD	0.165*	-0.170*	0.114	-0.211**	1.000					0.568	1.760	0.880
CF	-0.277**	-0.328**	-0.122	-0.466**	0.597**	1.000				0.461	2.171	0.833
CP	0.164*	0.284**	0.371**	0.381**	0.037	-0.291**	1.000			0.630	1.588	0.860
SC	0.217**	0.248**	0.302**	0.298**	0.023	-0.243**	0.461**	1.000		0.727	1.376	0.940
FM	0.267**	0.442**	0.143*	0.529**	-0.262**	-0.478**	0.390**	0.327**	1.000	0.575	1.740	0.914

***Correlation is significant at the 0.01 level (2-tailed).
 ** Correlation is significant at the 0.05 level (2-tailed).
 * Correlation is significant at the 0.10 level (2-tailed).

Table 3
Structural Characteristics and Local Content Practices.

Model 1: $LCP = \beta_0 + \beta_1CN + \beta_2CT + \beta_3IT + \beta_4IF + \beta_5AD + \beta_6CF + \beta_7CP + \beta_8SC + \beta_9FM + \epsilon$					
Predictors	B	t	p	Bias	Std. Error
(Constant)	1.911	4.687	0.000	-0.017	0.409
CN	0.254**	2.536	0.012	0.001	0.104
CT	0.004	0.037	0.971	0.005	0.135
IT	0.090	1.474	0.142	0.004	0.059
IF	0.076	0.805	0.422	-0.005	0.111
R-Sq.	0.104				
Adj. R-Sq.	0.085				
F	5.384				
sig	0.000				

dependant Variable: Local Content Practices.
 ***Significant at the 0.01 level (2-tailed).
 ** Significant at the 0.05 level (2-tailed). *Significant at the 0.10 level (2-tailed).

Table 4
Structural Characteristics and Local Content Practices.

Model 2: $LCP = \beta_0 + \beta_1AD + \beta_2CF + \beta_3CP + \beta_4SC + \beta_5FM + \epsilon$					
Predictors	B	t	p	Bias	Std. Error
(Constant)	0.899	1.673	0.096	0.052	0.670
AD	-0.100	-1.380	0.169	-0.002	0.075
CF	0.187**	2.285	0.023	-0.003	0.088
CP	0.315***	4.099	0.000	0.007	0.093
SC	0.139**	2.412	0.017	0.005	0.066
FM	0.202	1.871	0.063	-0.021	0.124
R-Sq.	0.210				
Adj. R-Sq.	0.191				
F	9.997				
sig	0.000				

dependant Variable: Local Content Practices.
 *** Significant at the 0.01 level (2-tailed).
 ** Significant at the 0.05 level (2-tailed). *Significant at the 0.10 level (2-tailed).

represented in Table 5. The study had nine hypotheses explaining the possible moderating effect of industrial regulation on the relationships between business networks' characteristics and local content practices. The findings show that, when IR is imposed, its interactions with some business network characteristics tend to produce a significant negative effect on LCP (Table 5). For example, industrial regulation interactions with some structural characteristics, especially continuity and complexity (i.e. CNIR and CTIR), produce negative effects to local content practice with coefficients of -0.161 and -0.179, respectively, at $p < 0.05$. This is also the case when industrial regulation interacts with some functional characteristics, especially conflict and cooperation (i.e. CFIR and CPIR) where significant negative effects are produced, with coefficients of -0.134 and -0.109, respectively, at $p < 0.05$.

6. Discussion and conclusions

6.1. Discussion

This study hypothesised that business network characteristics have a significant effect on local content practice. Empirical findings show that some structural characteristics, specifically continuity and complexity, and some functional characteristics, namely cooperation, socialisation and formalisation, have significant positive effects on local content practice. However, conflict has a significant negative effect on local content practice. This finding implies that, *given new market constraints, buyers will provide opportunities to local suppliers without any enforcement measures from the host government*. This runs contrary to previous studies, which indicated that, due to their existing business networks, oil and gas companies may not provide opportunities to local suppliers (Arthur and Arthur, 2016b; Ihua, 2010; Monday, 2015; Ngoasong, 2014; Nwosu et al., 2006). We therefore argue that buyers do not always wish to source from the same suppliers, which is consistent with some other studies (Balasingham, 2013; Chakraborty and Philip, 1996). These studies found that buyers may choose to source from outside the network in order to reduce dependence or develop key suppliers in the network. Also buyers may provide opportunities to local suppliers as a way of fulfilling their responsibilities to local communities as key business stakeholders (Freeman and Dmytryiev, 2017).

Our study also hypothesised that interactions between business network characteristics and industrial regulation would have a significant effect on local content practice. This hypothesis was developed based on the inconsistent findings about the effect of business network characteristics on firms' practices. The moderating effect of industrial regulation also depends on the fundamental relationship between business network characteristics and local content practice. If the imposition of industrial regulation is justified by market failure, it will produce a positive effect on local content practice (Joskow and Rose, 1989). However, the empirical findings show that interactions between some business network characteristics (continuity, complexity, conflict and cooperation) significantly reduce local content practice in Tanzania's oil and gas companies. This is an indication that, *buyer's intention to continue the relationship with key suppliers in the network cannot be reduced by pressure from the host governments*.

According to the theories of economic regulation (Posner, 1974; Stigler, 1971), industrial regulation is expected to produce a positive effect when business networks in the public interest model have a negative effect on the outcome variable (Joskow and Rose, 1989). In our study, most business network characteristics had positive effects on local content practice in the absence of industrial regulation. This means that there was no market failure to justify the imposition of industrial regulation. These results contradict some other empirical studies (Acheampong et al., 2016; Adedeji et al., 2016; Adomako and Danso, 2014) but are consistent with the theory of economic regulation, as argued by (Joskow and Rose, 1989) that, when business networks characteristics in the public interest model

Table 5
Interaction between Business Network Characteristics and Industrial Regulation.

Variables	Models		4	p	5	p	6	p	7	p	8	p	9	p	10	p	11	p
	3	p																
CN	.202	.001																
IR	.614	.000																
CNIR	−0.161	.035																
CT			.206	.001														
IR			.643	.000														
CTIR			−0.179	.043														
IT					.0711	.100												
IR					.620	.000												
ITIR					−0.002	.973												
IF							.047	.465										
IR							.630	.000										
IFIR							−0.028	.718										
AD									−0.042	.350								
IR									.627	.000								
ADIR									−0.093	.107								
CF											−0.093	.044						
IR											.619	.000						
CFIR											−0.134	.030						
CP													.217	.000				
IR													.598	.000				
CPIR													−0.109	.045				
SC															.092	.0316		
IR															.612	.000		
SCIR															.046	.270		
FM																	.165	.026
IR																	.631	.000
FMIR																	−0.160	.066
R ²	.506		.504		.474		.468		.476		.489		.535		.481		.491	
MSE	.249		.250		.265		.268		.264		.258		.234		.2615		.257	
F-Value	63.721		63.444		56.104		54.797		56.665		59.533		71.759		57.843		60.114	
P-Value	.000		.000		.000		.000		.000		.000		.000		.000		.000	

have a positive relationship with the local content practice, an imposed forceful measures may produce an adverse effect.

Furthermore, the findings show that interactions between the remaining characteristics of business networks (i.e. interdependence, informality, adaptation, socialisation and formalisation) and industrial regulation produce a non-significant effect on local content practices. This means that interaction between these characteristics and industrial regulation neither supports nor hinders local content practice. Therefore, it can be argued that *imposed industrial regulation does not result in the desired level of local content practice in host countries*. This finding runs contrary to the theory of economic regulation (Posner, 1974; Stigler, 1971) and to other empirical studies (Abdalla et al., 2013; Adedeji et al., 2016; Adomako and Danso, 2014).

6.2. Conclusion

The study concludes that business network characteristics do not prevent oil and gas companies from upholding proposed local content practices. More specifically, the companies will provide opportunities to local suppliers irrespective of existing business networks with world-class suppliers. The study further concludes that the use of measures to enforce local content practice do not produce any significant positive outcomes. This is because interaction between business network characteristics and industrial regulation can either significantly reduce local content practice, or produce a non-significant effect, but it cannot increase local content practice in the oil and gas companies. This finding can be further extrapolated to suggest that imposing industrial regulation cannot have any significant positive impact on the local community, but it may create adverse effects. This has theoretical and policy implications. According to the theory of economic regulation, market failure in the public interest model occurs when business network characteristics have a negative effect on the local content practices while they were supposed to have positive effect in order to benefit the local

community (Joskow and Rose, 1989). It is thus argued that industrial regulation should be imposed only when justified by market failure (Joskow and Noll, 1981; Posner, 1974; Stigler, 1971).

In policy terms, the finding that interactions between industrial regulation and some business network characteristics significantly reduce local content practice, while its interactions with other characteristics do not produce a significant effect on the same, implies that *host countries should not impose industrial regulation because it cannot produce the desired outcomes*. Empirical evidence shows that business network characteristics, which are the key factors, have a positive effect on local content practices in the absence of industrial regulation. This finding further implies that, in the context of this study there is no market failure justifying the imposition of industrial regulation. *Oil and gas companies, despite their business networks with competent suppliers, will still provide opportunities to local suppliers*. Policymakers, therefore, should reframe policy, for example by emphasising the development of local industries or encouraging localisation in the sense that oilfield service suppliers must register in Tanzania and/or establish relationships with local suppliers prior to beginning operations.

6.3. Limitations of the study

This study focused on investigating the moderating role of industrial regulation on the relationship between business network characteristics and local content practices in oil and gas companies. Contextually, the study drew its empirical evidence from oil and gas companies operating in Tanzania. Any generalisation of the findings, therefore, should consider the contextual attributes of the oil and gas sector. The local content practices explored in this study are those related to supplier development strategies. Specifically, these are sourcing strategies aimed at providing opportunities for locally based suppliers of oilfield services. The findings should not be generalised to include other local content practices, which may differ from those assessed in the study.

Appendix A: Variable Measurements

Variable	Measurements	Source
Local Content Practices (LCP)	This company prepares annual procurement plan for all of its requirements with strategies to encourage local bidders to bid This company issues general procurement notices to the public using local media This company advertises its requirements using local media Requirement specifications for this company are adjusted to fit local industries Evaluation criteria for the tenders are adjusted to fit local bidders	(Heum, 2008; Kinyondo and Villanger, 2017)
Continuity (CN)	Main supplier has capacity to fulfil this company's requirement Main supplier often meets this company's quality specifications Main supplier often meets this company's delivery specifications	(Håkansson and Snehota, 1995; Morgan and Hunt, 1994; Stanko et al., 2007)
Complexity (CT)	This company works with its main supplier to ensure quality of the delivery This company works with its main supplier to ensure on-time delivery This company works with its main supplier to ensure on-time payment	(Håkansson and Snehota, 1995; Kim, 2014; Nyuur et al., 2014)
Inter-dependence (ID)	This company relies heavily on its main supplier to achieve its own business objectives Main supplier relies heavily on this company to achieve its own business objectives Main supplier will incur costs if it decides to replace this company	(Caniëls and Gelderman, 2007; Kumar et al., 1995; Stanko et al., 2007; Turner et al., 2000)
Informality (IF)	Main supplier keeps promises it makes to this company This company believes the information from its main supplier Both this company and its main supplier operate in good faith	(Doney and Cannon, 1997; Stuart et al., 2012)
Adaptation (AD)	Just for main supplier, this company changed its requirement specification Just for main supplier, this company changed its stockholding policy Just for main supplier, this company changed its ordering practices Just for main supplier, this company changed its payment practices	(Hallen et al., 1991; Sheng et al., 2012; Wormald, 2017)
Conflicts (CF)	This company's business goal on product quality is different from that of main supplier This company's business goal on delivery terms is different from that of main supplier Main supplier intentionally refuses to meet this company's delivery expectations Main supplier for this company is inconsistent with its product quality	(Håkansson and Snehota, 1995; Reve and Stern, 1979; Rubin, 1994)
Cooperation (CP)	Both this company and its main supplier share resources in order to ensure quality Both this company and its main supplier share resources in order to ensure on-time	(Gadde and Snehota, 2000; Graca et al., 2015; Holm et al., 1996)

(continued on next page)

(continued)

Variable	Measurements	Source
Socialisation (SC)	delivery	(Gupta and Govindarajan, 2000; Kulangara et al., 2016; Lawson et al., 2009)
	Both this company and its main supplier share resources in order to ensure on-time payment	
	This company conducts joint workshops with its main supplier to learn best practices for ensuring on-time delivery	
	This company conducts joint workshops with its main supplier to learn best practices for ensuring on-time payment	
Formalisation (FM)	This company has cross-functional team with its main supplier in order to ensure quality of the supply	(Dwyer and Oh, 1988; Frazier et al., 1994; Heide and John, 1990; Li et al., 2010; Ohly et al., 2006)
	This company has cross-functional team with its main supplier in order to ensure on-time payment	
	There is a binding set of rules between company and its main supplier for ensuring quality	
	There is a binding set of rules between company and its main supplier for ensuring on-time payment	
	There is a binding set of rules between company and its main supplier for ensuring on-time communication	
	There is a signed contract between this company and its main supplier on product quality	
	There is a signed contract between this company and its main supplier on delivery terms	
Industrial regulation (IR)	There is a signed contract between this company and its main supplier on payment terms	(Joskow and Noll, 1981; Levi-Faur, 2010)
	This company sets aside funds to implement its programme for enhancing local industries' competitiveness	
	This company measures its performance in enhancing local industries' competitiveness	
	This company prepares reports on its performance in enhancing local industries' competitiveness	
	This company communicates its report on enhancing local industries' competitiveness	

Appendix B: Rotated Component Matrix^a

Items	Component CN	CT	IT	IF	AD	CF	CP	SC	FM
Cont7	0.791								
Cont8	0.795								
Cont9	0.781								
Comp1		0.733							
Comp2		0.441							
Comp3		0.677							
Interd1			0.736						
Interd2			0.826						
Interd5			0.816						
Inform1				0.713					
Inform2				0.844					
Inform3				0.789					
Adap1					0.770				
Adap3					0.792				
Adap5					0.873				
Adap7					0.860				
Conf1						0.785			
Conf2						0.712			
Conf9						0.530			
Coop4							0.775		
Coop5							0.819		
Coop6							0.747		
Soci2								0.858	
Soci3								0.851	
Soci4								0.913	
Soci6								0.856	
Form1									0.717
Form3									0.760
Form4									0.746
Form5									0.847
Form6									0.855
Form7									0.813
Total Eigenvalues	6.606	2.221	1.981	1.011	12.401	6.443	3.224	1.964	1.492
% of Variance	38.862	13.065	11.650	5.950	36.473	18.951	9.482	5.776	4.389

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

^a Rotation converged in 7 iterations.

Appendix C: Model Specification

Measuring the interaction effects between industrial regulation and characteristics of business networks on the local content practices

Model 1: $LCP = \beta_0 + \beta_1CN + \beta_2CT + \beta_3IT + \beta_4IF + \mathcal{E}$

Model 2: $LCP = \beta_0 + \beta_1AD + \beta_2CF + \beta_3CP + \beta_4SC + \beta_5FM + \mathcal{E}$

Model 3: $LCP = b_0 + b_1 CN + b_2IR + b_3 CNIR + \mathcal{E}$

Model 4: $LCP = b_0 + b_1 CT + b_2IR + b_3 CTIR + \mathcal{E}$

Model 5: $LCP = b_0 + b_1 IT + b_2IR + b_3 ITIR + \mathcal{E}$

Model 6: $LCP = b_0 + b_1 IF + b_2IR + b_3 IFIR + \mathcal{E}$

Model 7: $LCP = b_0 + b_1 AD + b_2IR + b_3 ADIR + \mathcal{E}$

Model 8: $LCP = b_0 + b_1CF + b_2IR + b_3 CFIR + \mathcal{E}$

Model 9: $LCP = b_0 + b_1 CP + b_2IR + b_3 CPIR + \mathcal{E}$

Model 10: $LCP = b_0 + b_1SC + b_2IR + b_3 SCIR + \mathcal{E}$

Model 11: $LCP = b_0 + b_1FM + b_2IR + b_3 FMIR + \mathcal{E}$

Appendix D: Summary of Interaction models

Models	Interaction	Coeff	Se	t	R ² -Change	p	BootMean	BootSE	BootLLCI	BootULCI
1	CNIR	-0.161**	0.076	-2.120	0.012	0.035	-0.154	0.105	-0.352	0.048
2	CTIR	-0.179**	0.087	-2.043	0.011	0.042	-0.170	0.097	-0.339	0.030
3	ITIR	-0.002	0.054	-0.034	0.000	0.973	0.006	0.073	-0.121	0.168
4	IFIR	-0.028	0.078	-0.362	0.000	0.718	-0.027	0.142	-0.304	0.240
5	ADIR	-0.093	0.057	-1.618	0.007	0.107	-0.099	0.088	-0.267	0.074
6	CFIR	-0.134**	0.061	-2.186	0.013	0.030	-0.140	0.083	-0.304	0.012
7	CPIR	-0.109**	0.054	-2.016	0.010	0.045	-0.103	0.067	-0.234	0.035
8	SCIR	0.046	0.042	1.106	0.003	0.270	0.036	0.076	-0.128	0.174
9	FMIR	-0.160*	0.086	-1.853	0.009	0.066	-0.151	0.100	-0.329	0.067

***Significant at the 0.01 level (2-tailed).

** Significant at the 0.05 level (2-tailed).

* Significant at the 0.10 level (2-tailed).

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