The interaction effect of government non-financial support and firm's regulatory compliance on firm innovativeness in Sub-Saharan Africa

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Abstract

Purpose – The purpose of this study is to assess the interaction effect of government non-financial support and firms' regulatory compliance on firms' innovativeness. Firms' regulatory compliance with environmental and safety issues has been suggested as one of the reasons why firms innovate. Such compliance provides legitimacy, improves reputation and corporate image, and enhances customer loyalty and competitive advantages, which influence firm innovativeness. However, regulatory compliance is costly and with limited resources, the role of government support is crucial as a moderator, to help firms become more compliant and influence their innovativeness.

Design/methodology/approach – The study uses data from the World Bank Enterprise Innovation Survey for seven countries in Sub-Saharan Africa.

Findings – Regulatory compliance has a positive and significant effect on firm innovativeness. Increased use of government non-financial support enhances the level of firm regulatory compliance and the effect of regulatory compliance on firm innovativeness.

Originality/value – The study contributes to the literature on compliance and firm innovativeness in Africa by showing how the positive effect of regulatory compliance on firm innovativeness is stronger when firms benefit from government non-financial support.

Keywords Regulatory compliance, Firm innovativeness, Government non-financial support, Sub-Saharan Africa (SSA)

Paper type Research paper

1. Introduction

The African continent is experiencing its fastest growth and the contribution of small and medium-sized enterprises (SMEs) innovation is a key determinant of this growth

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(George *et al.*, 2016). However, a general characteristic of African countries is the low institutional quality which represents a barrier to firm innovation (Olthaar *et al.*, 2017; Daniel *et al.*, 2018). Coupled with the region's other challenges, the World Bank's latest Africa's Pulse shows growth estimates at 3.6% in 2022, down from 4% in 2021 as the region continues to deal with new coronavirus disease 2019 (COVID-19) variants. Firms' innovation could contribute to economic development and growth in terms of improving employment, R&D and productivity, among others (Cirera and Muzi, 2020; Barasa *et al.*, 2017; Chakraborty and Chatterjee, 2017; Egbetokun, 2015; Wolff and Pett, 2006; Apanasovich *et al.*, 2016; Kang and Park, 2012; Hong *et al.*, 2016; Shyu *et al.*, 2002). This, therefore, suggests why policies to improve their innovativeness are needed (Apanasovich *et al.*, 2016).

There is a rise in sustainable businesses, and many firms are beginning to be complaint with government regulations regarding their product safety and their effect on the environment. Regulatory compliance is important for firm innovation, due to environmental and safety concerns of their products (Chakraborty and Chatterjee, 2017; Carter and Siddiki, 2021; Luan *et al.*, 2013; Nunan and Domenico, 2018; Lim and Prakash, 2014; Craig and Dibrell, 2006). Regulatory compliance affects innovation activities because it represents a cost burden to firms, which limits their investment in R&D and, therefore, affects their innovation (Paraskevopoulou, 2012; Lim and Prakash, 2014; Garcia-Marco *et al.*, 2020). Policies such as the Paris 2015 agreement provided a rallying call for firms to minimise the environmental impact of their activities, while still sustaining their business performance. However, being compliant also creates extra incentives for investment in R&D and such investment positively influences firm innovation (Blind, 2012). Regulatory compliance on product safety and its effect on the environment creates a positive corporate image that gives the firm some reputation and legitimacy against its competitors which positively influences innovation (Garcia-Marco *et al.*, 2020). Moreover, Porter (1991) has argued that well-crafted regulations can increase firm competitiveness and innovation.

Existing studies on the effect of regulatory compliance on firm innovation have been based on developed economies and have found overwhelming evidence of a significant positive effect (e.g. Carter and Siddiki, 2021; Chakraborty and Chatterjee, 2017; Craig and Dibrell, 2006; Lim and Prakash, 2014; Yang and Yao, 2012). However, due to limited resources, SMEs may be reluctant to be regulatory compliant because they are uncertain whether such investment in regulatory compliance will yield dividends in terms of improving innovation (Clo *et al.*, 2020). It is therefore suggested that government intervention, through innovation policies, is required to help firms navigate such challenges and help them to be compliant (Szczygielski *et al.*, 2017; Hong *et al.*, 2016; Shu *et al.*, 2015; Caerteling *et al.*, 2008; Xu *et al.*, 2014). While institutions can support firms to be compliant, the combined effect of institution and firm compliance on firm innovation should be stronger. This is because such support helps firms reduce the risk and cost involved in innovation, which helps enhance their competitiveness (Hong *et al.*, 2016; Caerteling *et al.*, 2008). However, to our knowledge, empirical evidence of how benefiting from government non-financial support can moderate the effect of regulatory compliance on firm innovativeness is limited.

However, with many countries in Sub-Sahara Africa (SSA) suffering from ineffective, inefficient or poor institutions and corruption (Alence, 2004), the effect of firm regulatory compliance on firm innovation, and whether innovation policies could moderate this relationship, is not known. Research suggests studies on innovation in developing countries, especially SSA, have been limited and that many of the studies exploring determinants of firm innovation in developed and emerging economies cannot be applied to less developed economies due to differences in the quality of their institutional contexts (Barasa *et al.*, 2017). While the limitation of such studies is due to the lack of availability of reliable and comparable data, the absence of such studies undermines the ability of governments to design and implement innovation policies (Cirera and Muzi, 2020). As a result, the interaction

effect between regulatory compliance (as a motive for innovation) and government non-financial support for firm innovation is not known.

This research uses data from the World Bank Enterprise Innovation survey for Africa to address the above gap in the literature and therefore contributes to the discussion on firm innovation in a developing context. We contribute by drawing on the regulatory compliance literature (e.g. Blind, 2012; Lim and Prakash, 2014; Paraskevopoulou, 2012), literature on institutional support (e.g. Barasa *et al.*, 2017; Schott and Jensen, 2016; Clo *et al.*, 2020; Szczygielski *et al.*, 2017; Krammer, 2019) and firm innovation (e.g. Jugend *et al.*, 2018; Apanasovich *et al.*, 2016) to provide evidence of how firms can improve their innovativeness by complying with government regulations. Specifically, we show how government support could be used or how firms could benefit from government support to become more compliant and therefore improve their innovativeness.

Innovation policy, which is referred to here as government innovation policy, has been broadly defined in innovation research (Shyu *et al.*, 2002). For example, innovation policies are policies developed to help firms build their capabilities to innovate (Georghiou, 2006). It is a set of actions designed to assist firms to improve the efficiency of their innovation activities (Rodriguez and Montalvo, 2007). Innovation policies are policy actions and institutions directly relevant to innovation activities (Lundvall and Borras, 2005). Edquist (2001) describes innovation policy as the government's action that targets innovation and that goes beyond science and technology (ST) policy to incorporate elements of various policy domains such as research and development (R&D) policy, technology policy, infrastructure policy, regional policy, education policy and public action influencing the demand for innovation. Paraskevopoulou (2012) conceptualises it in terms of regulations for innovation. The above definition shows a set of actions and institutions that help firms to build their capacity to innovate or improve their innovation activities. Based on such evidence, innovation policy in this research is referred to as training, R&D and marketing for innovation purposes, and provided to firms by the government. This view is relevant because it would highlight the benefit of innovation policy that can help firms to be compliant.

The rest of this paper is structured as follows. It starts with a review of extant literature, to develop the suggested framework. It then presents the data and discusses the methodology. Results are then presented before a discussion of the contribution, policy implications and limitations of the research.

2. Literature review

2.1 Theoretical consideration

This paper uses a combination of theories to argue for the direct and interaction effects in our model. This is important because there is a strong theoretical argument to show how the effect of the interaction is different from the main effects (Andersson *et al.*, 2014).

The main effect (effect of regulatory compliance on firm innovativeness) is argued from the competitive rationality perspective of Dickson (1992). The theory argues that, in a context of over-supply and a free market economy, customers are faced with an issue of choice. As a result, they become demanding, making sophisticated choices and the need for an alternative becomes even stronger. The implication is that firms will have to respond to these demands. Competitive rationality focuses on what a firm can do better than its competitors. Due to the dynamic nature of competition in the marketplace, firms have to learn quickly and respond to customers' demands. This research, therefore, explores whether being compliant with regulations related to the product can make customers switch from other alternatives and therefore increase the sales of the innovative product.

Institutions are the humanly devised constraints that structure human interaction and are either formal or informal (North, 1990). The distinction between these forms of institutions is

that while formal institutions are based on a contractual agreement, informal institutions are not and include aspects such as moral values, religious beliefs and other forms of behaviour that have passed the test of time (North, 1990). The focus of this research is on formal institutions. Smallbone and Welter (2001) suggest formal institutions influence entrepreneurial behaviour, and a favourable institutional context improves firm innovation because of improved business efficiency and reduced transaction costs. Peng *et al.* (2008) also suggest that an effective institutional context guarantees the rule of law, a fairer tax system; improve access to finance, ease of obtaining business and licensing permits among others. In an enabling environment, firms are encouraged to engage in risk-taking and innovative activities, which are associated with better performance (Krammer, 2019). The resources provided by the institutions could compensate for firms' limited resources or complement existing resources, and this combined effect on firm innovation is expected to be stronger (Egbetokun, 2015; Heredia Pérez *et al.*, 2019; Jugend *et al.*, 2018). However, when formal institutions become weak and inefficient, another institutional arrangement emerges (Olthaar *et al.*, 2017). A typical example is corruption (Belitski *et al.*, 2016; Daniel *et al.*, 2018). Shu *et al.* (2015) therefore see institutions as a double-edged sword, because they can facilitate and constrain firms' innovation.

This research focuses on the use of government non-financial support for innovation as the institutional variable. This relates to training in the use of innovative equipment, assistance in research and product development, and assistance and training for marketing innovations, which are all relevant in helping firms to become compliant. Context matters in innovation studies because the same innovation may have a different outcome in a different context (Lundvall and Borras, 2005). These differences could be based on the quality of the institutions as shown in Heredia Pérez *et al.* (2019) (see Figure 1).

2.2 Firm innovation

Firm innovativeness (percentage of sales from all products) is used in this research to measure the success of a firm's product/service innovation. However, existing literature has focused on a broad categorisation of how to measure firm innovation (Dziallas and Blind, 2019), with much research still relying on the Oslo Manual categorisation. The Oslo Manual measures firms' innovation as the introduction of new or significantly improved goods or services, and it can be either radical or incremental. This measure of firm innovativeness is well applied in extant research (e.g. Piening and Salge, 2015; Apanasovich *et al.*, 2016;

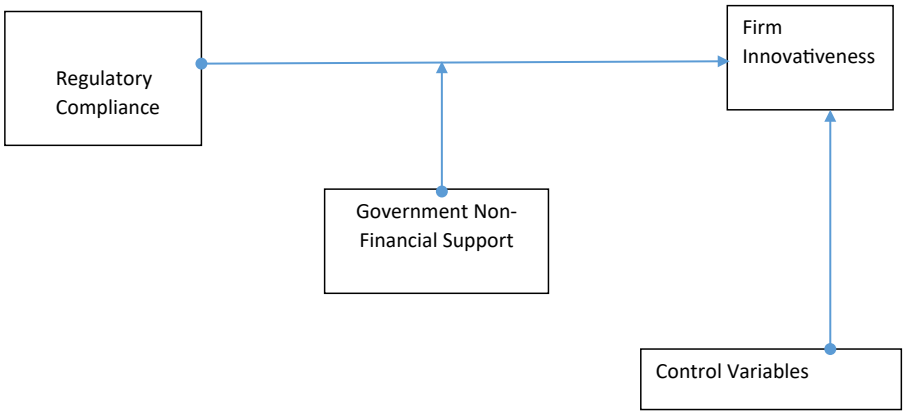

Figure 1.
The interaction effect of regulatory compliance and government non-financial support on firm innovation

Amara and Landry, 2005; Bocquet *et al.*, 2017; Clausen *et al.*, 2013; Davis and Bendickson, 2021; Grimpe *et al.*, 2017; Wadho and Chaudhry, 2018; Shu *et al.*, 2015). Amara *et al.* (2008) conceptualised the degree of innovation based on a score obtained from the summation of five different types of risks encountered by firms during the innovation process. These include the risk regarding the introduction of new equipment, the risk regarding marketing strategies, the risk regarding the replacement of former suppliers with new suppliers, the risk regarding the hiring of employees with new qualifications and the risk regarding the investment in new production technologies (Amara *et al.*, 2008). In Baker *et al.* (2016), a seven-point Likert scale was used to measure innovation performance based on the frequency in which new products are introduced and the percentage of sales generated from the new product. Andries and Faems (2013) used the proportion of turnover attributed to new or improved products, while others (e.g. Hong *et al.*, 2016; Grimpe *et al.*, 2017; Kang and Park, 2012; Shu *et al.*, 2015) used the number of patent applications.

In Burrus *et al.* (2018), innovativeness was measured using the patent index and suggested this may not be a good measure because not all products are patented by firms. In exploring the mechanism through which transformational leadership influences product innovation, Chen *et al.* (2014) used a 5-point Likert scale to capture the degree to which the product has achieved target market share relative to that officially assigned by the firm, with responses ranging from strongly agree to strongly disagree. Egbetokun (2015) explores it based on the number of innovation types that the firm produces. Such divergence in the measures of firm innovation will continue to generate mixed findings regarding the determinants of firm innovation. The use of objective measure (percentage of sales from all innovative products) is more robust because it provides a better way of accessing the success of the innovation beyond just considering whether new products were introduced or changes made to existing products.

2.3 Regulatory compliance

The Porter (1991) hypothesis of how well-crafted regulations can create a competitive advantage for the firm is still relevant in today's business environment, as firms are engaged in different innovation policies to gain competitive advantage (Carter and Siddiki, 2021; Lim and Prakash, 2014). Critics suggest regulatory compliance should be voluntary as firms faced with resource limitations may not have the incentive to bear the burden of correcting market failures (Lim and Prakash, 2014). While critics may argue regulatory compliance presents lock-in effects that restrict the ability of the firm to innovate, Porter views compliance as a competitive advantage and suggests that pollution reflects a waste of resources and by compliance, firms innovate to reduce such waste. Lack of regulatory compliance could pose a challenge for firm innovation and therefore affect economic growth (Yang and Yao, 2012). Firms use different tactics to survive in the business environment and remain competitive. Many firms now build legitimacy by engaging in business activities that are acceptable to their government (Nunan and Di Domenico, 2018; Carter and Siddiki, 2021). The benefit of legitimacy is even seen in cases where firms pirate products from competitors that are known to be environmentally friendly (Nunan and Di Domenico, 2018).

Legitimacy is relevant for competition and reputation can be negatively affected if firms are denied legitimacy by the government due to a lack of compliance. Firms subsequently benefit more from being compliant (e.g. corporate image, quality management, network ties, and revenue enhancement among others). Creditors may see them as low-risk borrowers and therefore grant them loans, while other stakeholders may be happy to engage with the firm innovation activities to improve the firm's innovation. Consumers are more loyal to businesses that are compliant with safety and environmental concerns, and loyalty gives the firm a competitive advantage and drives their innovation (Yang and Yao, 2012; Luan *et al.*, 2013).

With industry pressures and reputation at stake, firms see how competitors are improving their standards through compliance to remain competitive and therefore are forced to do the same, or risk losing market share (Carter and Siddiki, 2021).

Research exploring the relationship between regulatory compliance and firm innovation has shown overwhelming support for a positive effect. For example, Yang and Yao (2012) show how being certified increases a firm's profit by 3.5% and therefore suggest that it pays to be green. Lim and Prakash (2014) also found that a 1% increase in compliance resulted in about 0.096% increase in patents (a proxy for innovation activities). Lim and Prakash (2014) reveal that environmental compliance positively influences the return on assets. Regulatory compliance is a reputation value-driven phenomenon that many firms will be interested to improve their innovativeness (Craig and Dibrell, 2006). In comparing family and non-family firms, Craig and Dibrell (2006) show how compliance has a positive effect on firm innovation for family firms, rather than non-family firms, because family firms have a long-term strategic orientation, whereas non-family firms tend to have a short-term orientation. With evidence from China, Chakraborty and Chatterjee (2017) reveal that imposition of foreign regulation led to a significant increase in firms' innovation expenditure of between 11 and 61%. Such a positive effect was related to the spillover effects of regulatory compliance. Such positive effects are also reported in Carter and Siddiki (2021).

H1. Pursuing regulatory compliance will positively increase firms' innovativeness.

2.4 The moderation effect of government non-financial support

Firm innovation takes place within an institutional context and there are calls for a greater understanding of how this context influences firm innovation policies, to help governments better plan and predict the long-term future of firms (Szczygielski *et al.*, 2017; Clo *et al.*, 2020; Schott and Jensen, 2016; Paladino, 2007; Barasa *et al.*, 2017; Heredia Pérez *et al.*, 2019). The discussion of the institutional theory above suggests its effect on the firm is not linear. This is because the support firms obtain from the institutions can either help compensate for their limited resources or, when combined with their existing capabilities, can provide a competitive advantage and help them innovate. The moderation effect of government non-financial assistance for innovation is based on the fact that many developing economies, including those in Africa, are characterised as resource-constrained contexts, where firms will struggle to innovate (Xu *et al.*, 2014). With the costly nature of regulatory compliance (Lim and Prakash, 2014), firms suffer from limited resources to pursue innovation (Clo *et al.*, 2020; Blind, 2012; Yang and Yao, 2012) and the contribution of innovation to the economy (Cirera and Muzi, 2020; Barasa *et al.*, 2017; Chakraborty and Chatterjee, 2017; Egbetokun, 2015; Wolff and Pett, 2006; Apanasovich *et al.*, 2016), the need for designing innovation policies to support firms is now much stronger (Szczygielski *et al.*, 2017; Schott and Jensen, 2016).

Government support for innovation can be explained from different perspectives. For example, innovation compliance is costly due to its capital-intensive nature (Yang and Yao, 2012; Lim and Prakash, 2014) and the high possibility that competitors may copy the innovation, resulting in firms being unable to benefit from their supposed competitive advantage (Xu *et al.*, 2014). Many firms may not have such capital and therefore rely on the government for assistance to help them innovate and reduce the risk of a financial loss if their innovation is copied. There is also the aspect of knowledge transfer, which can be considered non-financial support. Expert knowledge is very valuable for firms and transferring or sharing such knowledge with firms through training and R&D activities helps strengthen their innovation.

Previous studies have examined the moderating effect of government support on different determinants of firms' innovation, but not as a moderator for the relationship between

regulatory compliance and firm innovativeness. For example, Barasa *et al.* (2017) show how government support moderates by positively strengthening the effect of firm resources on firm innovation. Also, while networking had a direct positive effect on firm innovation, Schott and Jensen (2016) demonstrated that the quantity of networks is not significantly influenced by institutional support. However, institutional support enhances the quality of networking. The existence of a policy in support of networking enhances an entrepreneur's belief in the benefit of networking and the benefit of networking becomes stronger with more support (Schott and Jensen, 2016). In Kang and Park (2012), government policy for innovation was found to affect firm performance directly and indirectly through inter-firm collaboration (networks). Networking enables firms to gain external expertise to influence their innovation, and with policies designed for networking, its importance in firm innovation cannot be ignored (Hong *et al.*, 2016).

Shu *et al.* (2015) describe government innovation support as a double-edged sword in the relation between patenting and innovation. Shu *et al.* (2015) reveal that the moderation effect of government support was positive and significant for just one of the patent motives while negative and significant for the rest. They concluded therefore that, while government support may help firms overcome potential effects brought by patenting, it could distract firms from commercialising their patented knowledge and therefore confirm the role of institutions as either an enabler or constrainer of firm innovation. Policies that are too rigid most often place restrictions on firms, which negatively affect their innovation (Shyu *et al.*, 2002). Caerteling *et al.* (2008) examine the effect of the different roles of government policy on innovation and concluded that, although the policy is not a key driver for innovation, it plays a part through its contribution to reducing the net cost of innovation.

In exploring determinants of firm innovation in a developing economy, Heredia Pérez *et al.* (2019) suggested a negative effect of institutional factors in innovation, which they argue could be explained due to low-quality institutions. Their work contributes to policy by suggesting that developing economies need strong institutions to drive innovation while suggesting that research on determinants of firm innovation is still an open space for debate. One of the very few studies that explore the moderating effect of government support on the relationship between innovation activity and innovation performance is Jugend *et al.* (2018), who found such moderation was positive and significant. Government support influences the behaviour of firms, and therefore it is important to examine its interaction effect with the reasons why firms innovate.

H2. Benefiting from government non-financial support positively moderates the effect of regulatory compliance on a firm's innovativeness such that the effect of regulatory compliance on firm innovativeness is stronger for firms benefiting from non-financial support than for those that do not benefit from non-financial support.

3. Methodology

3.1 Data

To evaluate the moderating effect of government non-financial support on the effect of regulatory compliance on firm innovativeness, data were obtained from the innovation survey data collected on Africa from the World Bank Enterprise Survey (WBES) in 2013. The WBES collects data to gauge the current investment climate in the economy by collecting data from manufacturing, retail and other services. The data are randomly collected from managers and business owners of both small, medium and large firms in different geographical and regional economies.

Studies on innovation in Africa have been constrained due to comparable and reliable data (Cirera and Muzi, 2020). The WBES data is a comparable database on institutions, innovation and firm performance and has helped to bridge this gap as it provides both objective and

subjective measures on innovation that are reliable and valid, providing different dimensions of measuring the phenomenon and has been widely used by many researchers.

Even though many variables in the dataset are captured with Yes/No questions, many articles in *Research Policy* journal have used the dataset. For example, Barasa *et al.* (2017) used this dataset to analyse the effect of institutions and resources on innovation in East Africa (Kenya, Tanzania and Uganda) with interesting results. Barasa *et al.* (2017) used logistic regression, due to the binary nature of their innovation variables (whether the firms have introduced new products or not). Morris (2018) also used the dataset and suggested models that use subjective data as dependent variables are likely to produce bias. Our dependent variable is an objective measure of the success of a firm's innovation, which minimises any issue of bias. Data were obtained from firms in the Democratic Republic of Congo, Ghana, Kenya, Tanzania, Uganda, and Zambia. These datasets are combined due to data availability constraints on regulatory compliance, government non-financial support and innovativeness.

3.2 Measurement of variables

It is important to avoid any gap between theoretical arguments and empirical constructs, such that the operationalisation measures what it is supposed to measure (Maula and Stam, 2019). Table 1 below presents a description of all variables.

3.3 Dependent variable

3.3.1 Firm innovativeness. We have measured firm innovativeness using a continuous variable based on the percentage of sales from all innovative products/services, which was

Variables	Description	Source
Dependent variable(s)		WBES
Firm Innovativeness	Percentage of sales from all innovative products (Log)	WBES
Why do firms innovate (Independent variable)		
Comply with government regulations	A binary variable on whether the reasons for introducing innovation was to comply with regulations or standards (e.g. safety or environmental regulations) with "1" = Yes and "0" = No	WBES
Institutional variable (moderating variable)		
Government non-financial Support	A binary variable on whether the firm receives any non-financial support from the government for innovation-related activities (This includes training in the use of innovative equipment, assistance in research and product development, and assistance and training for marketing innovations) with "1" = Yes and "0" = No	WBES
Control variables		
Product functions	A binary variable on whether the products have completely new functions with "1" = Yes and "0" = No, they do not	WBES
New technology	A binary variable on whether the products/services produced are based on a technology or design not already used by the firm with "1" = Yes and "0" = No, they are not	WBES
Product new to the local market	A binary variable on whether the products/services are new to the local market with "1" = Yes and "0" = No	WBES
Specialised employee	A binary variable on whether specialised employees were hired specifically for the purpose of developing the products with "1" = Yes and "0" = No	WBES

Table 1.
Description of variables

logged normalised. By not just focussing on the introduction of new product and services, our measure of innovativeness captures the contribution that all innovativeness products make to sales and therefore help determine competitive advantage. As discussed in the literature, using objective measures for innovation is the best way to capture any effect of its determinants and to better make policy recommendations.

3.4 Regulatory compliance

Regulatory compliance was measured using a binary variable in which firms were asked whether their reason for introducing innovation was to comply with government regulations or standards (e.g. safety or environmental regulations) with "1" = Yes and "0" = No.

3.5 Government support (non-financial)

A binary variable was also used to measure whether the firm receives any non-financial support from the government for innovation-related activities. This includes training in the use of innovative equipment, assistance in research and product development, and assisted training for marketing innovations, with "1" = Yes and "0" = No. Such measures of government support have been well utilised in research (e.g. Jugend *et al.*, 2018; Kang and Park, 2012).

3.6 Control variables

In developing and testing theory, it is important to rule out an alternative explanation for suspected effects (Aguinis *et al.*, 2021). This is because it involves measuring variables assumed of having a relationship between either the dependent or independent variable and adding them to the analysis, which removes the potential of any contamination in the suspected relationship. The aim is, therefore, to ensure that the significance of the suspected relationship remains unchanged when the controls are added to the analysis. Likewise, control variables must be theoretically relevant (Maula and Stam, 2019) and not based on previous studies, which in many cases may be contextually different or flawed (Aneshensel, 2002). The focus should not be on including many controls to pursue methodological trickery, as more is not necessarily better (Cuervo-Cazurra *et al.*, 2016). Controls that are theoretically relevant are therefore able to satisfy the criteria for spuriousness (Aneshensel, 2002; Cuervo-Cazurra *et al.*, 2016). The following control variables are therefore considered.

The first control was whether the product has a completely new function with "1" = Yes and "0" = No. Consumers' demands are complex and always changing, and firms need to be innovative to meet such demand. By developing products with new functions, firms can differentiate themselves, rival competitors and improve sales. The second was whether the new product is based on a new technology or design that is new to the firm with "1" = Yes and "0" = No. Technology adoption within a firm is beneficial when the firm has built some capabilities to make efficient use of such technology. New technology may lead to more efficient production processes and marketing of the product to generate sales. The last control was whether specialised employees were hired specifically to develop the product with 1" = Yes and "0" = No. From the resource-based perspective, skilled labour is a valuable and rare resource, and its configuration with other resources may be the source of competitive advantage. Skilled labour can have a positive effect on the innovativeness of the product by influencing its development and marketing.

Apart from the measurement of firm innovativeness, which was objective, all other variables were based on subjective measures, and we are aware of their limitations on issues like common method variance (Wall and Wood, 2005). However, Wall and Wood (2005) suggest subjective measures may not be biased as many suggest. This is evident in

Forth and McNabb (2008) in which such measures were shown to be alternatives to objective measures based on strong correlation evidence. It is therefore not surprising that subjective measures are widely used as proxies for capturing real variables of interest in many pieces of research, such as the WEBS data.

3.7 Common method bias (CMB)

Sampling is important because it provides an opportunity to make inferences on the representativeness of the data and the generalisability of the results (Aguinis and Solarino, 2021). However, common method bias is frequently used with cross-sectional and survey data (Paladino, 2007; Shu *et al.*, 2015). It suggests the existence of common method variance in data will create a false internal consistency among the variables and therefore lead to bias (MacKenzie and Podsakoff, 2012; Chang *et al.*, 2010). Many researchers have used ex-post techniques to argue for common method bias in their analysis (Podsakoff *et al.*, 2012; MacKenzie and Podsakoff, 2012). However, Richardson *et al.* (2009) suggested that no amount of ex-post test could adequately compensate for poor research design and therefore researchers should focus on developing a good research design to collect valuable, reliable and quality data. For measurement validity and transparency, and issues of common method bias (Podsakoff *et al.*, 2012), it is important to provide a clear explanation of how the data were collected (Maula and Stam, 2019). This research has therefore focused on the *ex ante* approach, with a detailed explanation of the data collection process of the WBES data, to argue that the data do not suffer from issues of CMB or if it does, its effect could be very minimal in our analysis.

The WBES guarantees the anonymity and confidentiality of participants (Podsakoff *et al.*, 2003). The questionnaire is consistent and comparable, and it is written in simple English without any vague terminology (Podsakoff *et al.*, 2003). This, therefore, enables participants to provide honest answers, which could reduce any bias (Chang *et al.*, 2010). Moreover, the dependent variable (firm innovativeness) is measured differently from the other variables, and participants were expected to answer more than 80 questions, which implies variables were on different pages to reduce recalling previous responses (Baker *et al.*, 2016). Also, the way the questions are asked in the WBES does not suggest any relationships between our variables of interest. This, therefore, restricts a participant's cognitive ability to combine variables to create a correlation that could lead to bias. Using cross-sectional data from five African countries makes it unlikely for the cognitive abilities of participants from different countries to be the same (Podsakoff *et al.*, 2003). The design of the data collection process used in the WBES is therefore robust, providing reliable data.

Podsakoff *et al.* (2003) suggested several types of ex-post approaches that researchers could use. In the ex-post approach, the analytical framework used in exploring the moderation effect between the dependent and independent variable is unlikely to be part of the respondent's cognitive capability and therefore reduces the likelihood of common method variance (Chang *et al.*, 2010; MacKenzie and Podsakoff, 2012). Looking at the correlation statistics for discriminant validity, this research, therefore, suggests that the data do not suffer from common method bias (Podsakoff *et al.*, 2003). Moreover, we have applied control variables that are theoretically relevant to our dependent variable to control for any possible confounding relationships or to rule out alternative explanations of our suspected effect (Aguinis *et al.*, 2021; Clausen *et al.*, 2013). Finally, we used the variance inflation test to examine the variance inflation factor (VIF) for the constructs. The mean test score for each model is less than 2 as shown in Table 3 and none of the individual variables had a score above 2. Given that these indicators are within the acceptable threshold (Tabachnick and Fidell, 2001), we, therefore, conclude that common method bias and multicollinearity were not a concern, and therefore our data are fit for purpose. Finally, endogeneity is not a problem in

our model because all our regressors are binary for which we have acknowledged its limitation in our research. But rather than using the ordinary least squares (OLS) estimator, we have used instrumental variable generalised method of moments (IV-GMM) approach which addresses the endogeneity of the explanatory variables anyway.

4. Data analysis and results

Interaction effects are only considered a contribution to literature if there is a theoretical justification as to why it could provide a better theoretical understanding of a supposed relationship and of which such justification is different from that of the main effect (Andersson *et al.*, 2014). We argue in this research that any attempt for firms to innovate is in response to some constraints or problems that they have to resolve. Regulatory compliance is therefore considered as one of those responses that affect firm innovativeness directly. Moreover, we argue that the institutional context, in terms of government provision of non-financial support, can help firms become more compliant and therefore increases the compliance effect on the firm innovativeness.

Based on the above, a series of multiple hierarchical regression is used to analyse the data, due to the objective measure of firm innovativeness as a continuous variable on the percentage of sales from all innovative products, which was logged normalised. The model below is used to the moderate effect of the use of government non-financial support.

$$Y_{ij} = \beta_0 + \beta_1 RC_{ij} + \beta_2 GS_{ij} + \beta_3 RC * GS_{ij} + [\beta_4 PF_{ij} + \beta_5 NT_{ij} + \beta_6 NM_{ij} + \beta_7 SE_{ij}] + \epsilon_{ij}$$

where Y*ij* is the dependent variable (firm innovativeness) for an individual observation (with *I* belonging to the firm and *j* the country to which the firm belongs). β_0 is the overall intercept, which is the mean of the intercepts across all samples. β_{1-7} are the slopes of respective variables. *RC* is regulatory compliance. *GS* is government non-financial support. *RC***GS* is the interaction effect between RC and GS on firm innovativeness. *PF* is a new product function. *NT* is new technology used to develop the product. *SE* is the use of specialised employees, and ϵ_{ij} *is the standard error term.*

The first stage was to regress the control variables against the dependent variable without the independent and moderator variable. The second stage was to regress the independent and moderator variables against the dependent variables excluding the control variables. The third stage was to regress the independent and moderator variable including control variables against the dependent variables. The reason for this was to better address alternative explanations of the result by making sure that the direct and interaction effects were not due to the effects of any of the controls. Table 2 presents the correlation statistics between the variables with the upper and lower figures representing the correlation coefficients and corresponding probabilities.

In some situations, the control variables may have more explanatory power than the independent variable (Cuervo-Cazurra *et al.*, 2016). We start by discussing the significance of our control variables. The only significant control variable on firm innovativeness was the use of specialised skilled labour as shown in Table 3, Model 1 ($\beta = 0.075$, $p < 0.1$). This confirms how valuable skilled labour could be in product innovation. However, the other control variables did not have a significant effect on firm innovativeness as shown in Table 3 Model 1. The direct effect of regulatory compliance on firm innovativeness was positive and significant as shown in Table 3 Model 2 ($\beta = 0.330$, $SE = 0.040$; $p < 0.01$)and therefore confirm that, when firms are compliant with government regulations, they gain legitimacy and reputation which influences their innovativeness as costumers become more loyal and respond with sales increases. Table 3, Model 3 is a non-hypothesised relationship between government support and firm innovativeness which though positive is not significant

Table 2.
Correlation and descriptive statistics

	N	Mean	SD	Min	Max	A	B	C	D	E	F	G
Firm Innovativeness (A)	1,188	3.55	0.71	0.69	4.6							
Regulatory Compliance (B)	3,227	0.44	0.49	0	1	0.214*** (0.00)						
Gov. Non-Financial Support (C)	7,356	0.06	0.23	0	1	0.040 (0.20)	−0.012 (0.69)					
New Product Function (D)	3,265	0.64	0.48	0	1	−0.043 (0.17)	−0.071** (0.02)	−0.040 (0.02)				
New to firm technology being used (E)	3,183	0.55	0.49	0	1	0.037 (0.24)	0.130*** (0.00)	0.014 (0.64)	0.242*** (0.00)			
Product new to local market (F)	3,193	0.21	0.4	0	1	−0.017 (0.59)	0.057* (0.07)	0.002 (0.94)	0.021 (0.51)	0.153*** (0.00)	0.658*** (0.00)	
Specialised employees (G)	3,242	0.33	0.47	0	1	0.047 (0.14)	0.004 (0.89)	0.038 (0.23)	0.065** (0.04)	0.069** (0.03)	0.019 (0.55)	0.029 (0.37)

Note(s): Probabilities in parentheses ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

Variables	(1) Firm innovativeness	(2) Firm innovativeness	(3) Firm innovativeness	(4) Firm innovativeness	(5) Firm innovativeness	(6) Firm innovativeness	(7) Firm innovativeness
Regulatory Compliance (B)		0.330***		0.325***		0.309***	0.287***
		(0.040)		(0.043)		(0.047)	(0.049)
Gov. Non-Financial Support (C)			0.107		0.092	0.107	−0.029
			(0.091)		(0.092)	(0.088)	(0.133)
B*C							0.311*
							(0.163)
New Product Function	−0.060			−0.035	−0.089*	−0.066	−0.064
	(0.046)			(0.046)	(0.051)	(0.051)	(0.051)
New to firm technology being used	0.034			0.018	0.057	0.039	0.037
	(0.045)			(0.046)	(0.049)	(0.050)	(0.050)
Specialised employees	0.077*			0.055	0.073	0.069	0.071
	(0.044)			(0.043)	(0.048)	(0.047)	(0.048)
Product new to local market	0.020			−0.035	−0.030	−0.077	−0.078*
	(0.044)			(0.043)	(0.048)	(0.047)	(0.047)
Constant	3.529***	3.392***	3.538***	3.400***	3.549***	3.420***	3.430***
	(0.043)	(0.029)	(0.023)	(0.047)	(0.048)	(0.053)	(0.053)
Observations	1,145	1,166	1,020	1,126	986	970	970
R^2	0.004	0.053	0.001	0.054	0.008	0.055	0.058
Mean VIF	1.32	n/a	n/a	1.30	1.26	1.25	1.41

Note(s): Robust standard errors in parentheses; ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

Table 3.
Regression results

($\beta = 0.107$, $SE = 0.097$; p = ns). This lack of significant direct effect may explain why the institutional context is a facilitator of effects rather than cause of effects. When the control variables where added to the regression as shown in Table 3 Model 4 ($\beta = 0.322$, $SE = 0.042$, $p = 0.01$), Table 3 Model 5 ($\beta = 0.92$, $SE = 0.092$; p = ns) and Table 3 Model 6, the direct effect of regulatory compliance and government support on innovation did not change. This result is important because it rules out the alternative explanation that the effect of regulatory compliance and government support on firm innovativeness could have been due to the influence of any of the control variables. The interaction effect of government non-financial support and regulatory compliance on firm innovativeness is positive and significant ($\beta = 0.304$, $SE = 0.161$; $p < 0.1$). This, therefore, confirms that firms using government non-financial support can use such support to substitute and strengthen their compliance and therefore innovate more.

Figure 2 above shows the interaction effect of regulatory compliance and government support on firm innovativeness. The interaction effect shows that, with lower usage of government non-financial support (1 standard deviation below the mean), the effect of regulatory compliance on firm innovativeness is negative. However, with the high usage of government non-financial support (1 standard deviation above the mean), the effect of regulatory compliance on a firm's innovativeness is positive. This, therefore, confirms the moderation of effect by suggesting that the more firms benefit from such support, the higher their level of innovativeness.

5. Conclusion: discussion, implications and future research directions

The results from the data analysis provide support for the significant effect of regulatory compliance on firm innovativeness and the interaction effect between regulatory compliance and the use of government non-financial support on firm innovativeness. Firms' innovation evolves within an institutional context that is not only required to provide resources or support but whose actions influence the behaviour of firms and the outcome of their activities. With many studies suggesting governments in Africa need to create an enabling business environment, this research, therefore, highlights how relevant the use of government non-financial support can be for firm regulatory compliance and innovation.

In the above results, regulatory compliance had a positive and significant effect on firm innovativeness. This result aligns with the views from extant literature (e.g. Carter and Siddiki, 2021; Chakraborty and Chatterjee, 2017; Lim and Prakash, 2014; Craig and Dibrell, 2006; Yang and Yao, 2012) about the positive effect of regulatory compliance on innovation.

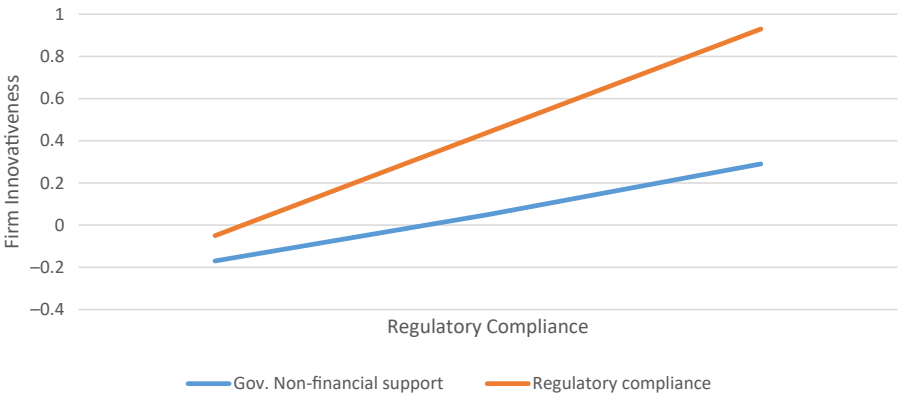

Figure 2.
Interaction effect RC and GS

This level of significance did not change even with the introduction of control variables. This, therefore, suggests how influential regulatory compliance can be in enabling firm competitiveness (Porter, 1991) and innovativeness (Blind, 2012; Chakraborty and Chatterjee, 2017). This result brings forth a very important theoretical contribution to the theory of competitive rationality (Dickson, 1992) on firm innovativeness in Africa. The key to the competitive rationality theory as highlighted in section 2.1 is the change in buyers' or consumers' preferences. Our research demonstrates that buyers have a preference for innovative products from businesses that are compliant with safety and environmental concerns than for businesses that are not. One of the ways for firms in Africa to sustain their competitive advantage is therefore through regulatory compliance to make gains from the many consumers who are now developing a buying habit for sustainable products.

Irrespective of the significance of regulatory compliance on firm innovativeness, the business environment or context plays an important role in understanding the behaviour of firms (Lundvall and Borras, 2005; Heredia Pérez *et al.*, 2019). We, therefore, draw on some context-specific factors that could moderate this relationship. We draw on the provision of government support (Szczygielski *et al.*, 2017; Clo *et al.*, 2020; Schott and Jensen, 2016; Jugend *et al.*, 2018) to discuss the indirect contribution of institutions to firm innovativeness (Carter and Siddiki, 2021). To confirm the moderation effect, Figure 2 shows that increased use of government non-financial support increases the effect of regulatory compliance on firm innovativeness. The link between regulatory compliance and firm innovativeness can be strengthened by firms benefiting from a high level of institutional support. This support could come from firms benefiting from government assistance in R&D in product development and assisted training for marketing innovation. Many governments in African countries have an R&D department and the capacity to provide training to businesses.

While many firms in Africa suffer from limited resources, the capital-intensive nature of regulatory compliance may be a difficult challenge for them to pursue (Xu *et al.*, 2014; Lim and Prakash, 2014; Yang and Yao, 2012). Firms can therefore use these R&D facilities to develop and test their product and also benefit from government training in the use of equipment required for the production and marketing of innovation. Therefore, through access to such resources, firms can overcome their resource limitations, become more compliant and therefore increase their innovativeness. In summary, therefore, we contribute to existing knowledge by exploring the boundary conditions under which firms could make more gains from being compliant. We do this by combining the competitive rationality and the institutional theory to understand their joint effect on firm innovativeness in Africa.

The results of this research have implications for policymakers in SSA. In a time when Africa is experiencing growth (George *et al.*, 2016), the role of institutions in innovation is now becoming increasingly relevant (Barasa *et al.*, 2017; Jugend *et al.*, 2018; Clo *et al.*, 2020). When the former US president (Barack Obama) visited Africa during his last term of office, in his address to the Africa Union leaders, he reiterated that what Africa needs now is strong institutions and not strong men. This intervention was necessary as a wake-up call for governments to develop policy initiatives to support businesses and capitalise on the continent's growth potential. Research has suggested several ways in which governments can create such enabling environments. Examples include fighting corruption and being truthful in enforcing the role of law (Barasa *et al.*, 2017; Clo *et al.*, 2020). The fight against corruption will reduce much of the bureaucracy involved in gaining access to and benefiting from government support. This is important because corruption does not just discourage investments but also funds that could have been used for investment purposes are now being bribed.

Understanding the positive impact of government policy on firm innovativeness provides an opportunity for policymakers to prioritise policy investment, to predict and ensure long-term economic growth (Jugend *et al.*, 2018). Moreover, policy should create networking opportunities for firms to overcome their liabilities and build competitive advantage

(Schott and Jensen, 2016). While policies should be focused on the stages of development of the firm, there needs to be strict enforcement of contracts to make sure firms use such support for the intended purpose (Szczygielski *et al.*, 2017; Hong *et al.*, 2016). Knowing the effect of government policies can guide governments in increasing spending on innovation, and this will also encourage firms to invest, knowing there are available resources (Hong *et al.*, 2016). There is also the need to develop and establish collaboration between research institutions, such as universities and firms to enable knowledge transfer for innovation (Xu *et al.*, 2014).

Many firms may ignore regulatory compliance because of a lack of information about its potential benefit and therefore governments need to raise awareness of such benefits to increase the number of compliant firms (Lim and Prakash, 2014; Yang and Yao, 2012). Firms lacking the capability of regulatory compliance are less likely to innovate. Based on the positive effect of government support on regulatory compliance (Paraskevopoulou, 2012), and as evidenced in our analysis, the policy recommendation to governments is to develop appropriate policies to help firms be compliant. Another policy initiative is for the government to develop innovative policies that encourage networks to enable firms to reduce the cost of regulatory compliance (Paraskevopoulou, 2012). Firms' innovation is a catalyst for growth, and governments need to support firms with both financial support as well as non-financial support (Caerteling *et al.*, 2008).

While acknowledging the contribution that this research brings to existing literature and the SSA context, there are still avenues for future research. First, the innovation survey data from WBES in Africa does not exist in all countries. The five countries used in this research are the best combinations with data on a specific year (2013). The focus on cross-sectional data in the same year was to have a robust result. However, as more data on the innovation survey becomes available, we urge researchers to re-examine the assumptions in this research. Second, many institutional variables have not been examined in this research such as financial support, rule of law, etc., that could also have a moderating impact on the supposed relationships. Future research, therefore, needs to examine the impact of such variables.

Third, as more innovation surveys from the WBES become available, future studies could use the unique identifier for each firm and country to develop panel data and use this to examine the effect of time on the proposed model, as regulatory compliance may take time to materialise and its effect on firm innovation may need to be captured over time. Regulatory compliance and government non-financial support as captured in the WBES only view compliance as related to safety and environmental issues, while government non-financial support focuses on training in the use of innovative equipment, assistance in research and product development, and assistance and training for marketing innovations. While this study provides a basic understanding of these issues in Africa, future research will need to identify specific regulatory compliance and government non-financial support to explore their effects on innovation and therefore test the applicability of this research. Moreover, future studies can also build on an apparent caveat of "variable omission bias" owing to data availability constraints at the time of the present study. Accordingly, when controlling some confounding effects of the R&D regulatory framework links in SSA, in order to mitigate "variable omission bias", it is worthwhile to include variables such as financial leverage, firm age, future growth opportunities, cash flow/internal finance and capital intensity (or capital structure), *inter alia*.

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