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The mediation effect of innovation in the relationship between external knowledge and firm performance in Africa

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ABSTRACT

The purpose of this research is to explore empirically the mediation effect of firm innovation on the relationship between external knowledge and firm performance. Using cross-sectional data from the World Bank Enterprise Survey in ten sub-Saharan African (SSA) countries, a range of analysis was conducted to test for the mediation effect. We used Baron and Kenny's (1986) triple test for mediation to understand the nature of mediation and the product of the coefficient approach to compute three different mediation tests (the Sobel test and the Aroian and Goodman tests) including the bootstrapping confidence interval. The result confirms innovation mediates the relationship between external advice and firm performance. The study contributes to the limited literature on the mechanism through which external knowledge could positively influence firm performance, especially in a developing country context (Africa) where existing literature has focused more on how external knowledge influences firm innovation.

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1. Introduction

Innovation is the introduction of goods and/or services which could either be new to the firm or the market (Filiou, 2021; Vega-Jurado et al., 2009). Innovation is a significant determinant of firm performance as it enables firms to sustain their competitiveness (Burrus et al., 2018; Flamini et al., 2022; Medase & Abdul-Basit, 2020). One common response to sustaining competitive advantage is to pursue open innovation (Baumstark, 2020; Filiou, 2021; Kesidou & Snijders, 2012; Ollila & Yström, 2017; Sala et al., 2016). Open innovation represents the inflow of knowledge (inbound open innovation) into firms for innovative purposes (Alexiev et al., 2010; Knoben & Oerlemans, 2010) and the outflow of

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knowledge (outbound open innovation) out of firms by transforming knowledge into commercial products and/or services (Filiou, 2021; Hydle & Billington, 2020; Parida et al., 2012). Firms are often involved in a range of collaborations with different partners such as research organizations, business incubators, suppliers and consumers for the transfer of knowledge to the firms (Knoben & Oerlemans, 2010; Ritala et al., 2015; Xie et al., 2020). External knowledge from these collaborations can facilitate the production of goods and services. (Medase & Abdul-Basit, 2020; Xie et al., 2020).

External advice from different actors helps firms recognize opportunities, learn better management practices sustain their competitiveness via innovation and improve their performance (Alexiev et al., 2010; Kesidou & Snijders, 2012; Knoben & Oerlemans, 2010; Vega-Jurado et al., 2009). External advice and external knowledge have been used interchangeably in existing research to mean firms' search for external knowledge (e.g., Goedhuys, 2007; Medase & Abdul-Basit, 2020). The use of such knowledge broadens the firm's resource base, enabling the firm to benefit from knowledge heterogeneity. Knowledge heterogeneity is crucial as it enables firms to reconfigure such knowledge to develop strategies to improve their performance (Flamini et al., 2022; Sala et al., 2016; Seo, 2020; Tang, 2016).

Given the role of external advice in influencing firms' performance, significant gaps still remain in understanding the transformative process or mechanism through which external advice could translate into improved firm performance (Goedhuys, 2007). For example, existing studies have examined the relationship between external knowledge and firm innovation (e.g., Antonelli & Fassio, 2016; Pateli & Lioukas, 2019), the relationship between firm innovation and firm performance (e.g., Piening & Salge, 2015), and or the relationship between external knowledge and firm performance (e.g., Peeters & Martin, 2017). Even literature on emerging countries such as those in Africa (e.g., Egbetokun, 2015; Knoben & Oerlemans, 2010; Medase & Abdul-Basit, 2020; Oluwatope et al., 2014) has also mainly focused on the relationship between external knowledge and firm innovation. The testing of this relationship is necessary because the inadequate understanding of this transformative process creates doubt on how firms can transform external advice into improved performance. We uncover this black box by empirically testing the role of innovation as a possible mechanism through which firms can transform external advice into new products and/or services which subsequently improves their competitiveness and therefore their performance.

This study is also motivated by the fact that while existing studies on open innovation and firm performance have focused more on advanced economies (e.g., Alexiev et al., 2010; Filiou, 2021), there has been limited research (e.g., Goedhuys, 2007; Medase & Abdul-Basit, 2020) on open innovation and firm performance in Africa. This is despite Africa being on the rise as the fastest-growing economy in the world (Amankwah-Amoah & Medase, 2024). The predominant focus on developing countries calls into question the generalizability of findings for the African context which is significantly different from countries in the developed world (Adomako & Ahsan, 2022), especially regarding institutional development and inadequate research and development capabilities (Eijdenberg et al., 2019; Urban & Kujinga, 2017) which could hinder firms' ability to search for knowledge and how such knowledge is transformed into new products and/or services (Eijdenberg et al., 2019; Goedhuys, 2007; Seo, 2020). Failing to examine the behavior of

firms in such circumstances limits the broader application of theory to resource-constrained contexts (Oerlemans et al., 2022).

Based on the above, we adopted Baron and Kenny's (1986) triple test for mediation to understand the nature of the mediation effect. In addition, we used the product of the coefficient approach (the Sobel test and the Aroian and Goodman tests), including the bootstrapping confidence interval to test for the significance of the mediation effect. The authors' theoretical argument is therefore rooted in the resource-based view (RBV) (Barney, 1991). Core to the RBV is the fact that firms need a combination of resources to be innovative and sustain their competitiveness (Medase & Abdul-Basit, 2020). To achieve the aim of this research, data were collected from the World Bank Enterprise Survey from a sample of 1,964 firms from ten sub-Saharan African (SSA) countries.

The findings of this research contribute to the literature on external advice and firm performance. We find that external advice has a direct and indirect effect on firm performance. Indirectly, external advice influences firm innovation and firm innovation influences firm performance. Our findings therefore illustrate how firm innovation mediates the effect of external advice on firm performance. The evidence shows the need for firms to transform new external knowledge into new products and/or services which eventually influences performance. In the context of Africa, we expand on the work of Medase and Abdul-Basit (2020), Egbetokun (2015), and Omolayo et al. (2014) who have examined the relationship between external knowledge and firm innovation but not the mechanism through which innovation could act as mediation on the relationship between external advice and firm performance.

The rest of the paper is structured as follows. Section 2 provides a review of relevant literature. Section 3 focuses on the method of data collection and measurement of variables, while Section 4 presents the results. In Section 5, we focus on discussing the results, contributions, and limitations of the study.

2. Review of the Literature

To test for innovation as a mediator between external knowledge and firm performance in Africa using the Baron and Kenny (1986) robust triple test for mediation, we start by discussing how external knowledge search is important for firm innovation, particularly in Africa. A discussion of key themes in the existing literature on external knowledge search then follows. After this, we present some empirical literature to show the contradictions in the existing literature and how such contradictions inform this research. In the final section, we show how our research can contribute to the existing literature.

There are a variety of reasons why firms seek external advice or knowledge for business management. One of these could be the power relationship between the manager and the team members within the firm. (Menon et al., 2006). Due to competition for positions within the firm, managers may not wish to expose their weaknesses by seeking advice from other members of the firm. Another reason could be due to inadequate human capital within the firm, making it difficult for any complementary or new knowledge to emerge from within the firm (Carnabuci & Diószegi, 2015). This is relevant, especially in the African context where low in-house R&D and human capital development such as limited staff training (Omolayo et al., 2014) and inadequate education systems affect the quality of the available labor force (Urban & Kujinga, 2017). Since innovative and

better-performing firms are those benefiting from a variety of knowledge sources (Filiou, 2021; Vega-Jurado et al., 2009), poor-performing firms may be more inclined to seek expert advice to help them develop improved strategies to improve their performance (Menon & Pfeffer, 2003). Yet another reason could be that many developing economies suffer from poor institutional quality which limits their access to resources and their ability to build internal capabilities while also increasing innovation costs (Bilgili et al., 2016). This, therefore, influences firms in such economies to seek external business management knowledge to sustain their competitiveness.

For SMEs, seeking external advice may be a way to obtain quality knowledge for strategic decision-making to improve their innovation and performance (Bilgili et al., 2016; Goedhuys, 2007; Ko et al., 2021). Such external knowledge is considered to be of superior quality, offering a much better perspective on the dynamics of the business environment since it comes from actors who understand market dynamics (Becker & Gassmann, 2006; Carnabuci & Diószegi, 2015; McDonald et al., 2008). External knowledge is beneficial because it enables the firm to improve its decision-making process and improve its ability to make correct and accurate decisions (Bilgili et al., 2016).

Firms obtain external knowledge by seeking external advice from a range of different actors such as suppliers, consumers, competitors, governments, incubators and other business service providers (Oerlemans et al., 2022; Wang et al., 2015; Xie et al., 2020).

For example, knowledge from suppliers will provide firms with a better understanding of their supply chain and how it could affect their business. Information from business incubators could provide firms with expert advice on how to grow their business and manage risk and expectations, as well as provide infrastructure (Becker & Gassmann, 2006). Knowledge obtained from government institutions may also provide directives on how to obtain assistance and the implications of non-regulatory compliance. Penalties for non-regulatory compliance may increase operating costs and this would reduce investment and therefore performance. External knowledge from consumers and suppliers can provide and facilitate the knowledge for a market requirement for producing goods and services, thereby influencing the innovative ability of the firm (Medase & Abdul-Basit, 2020; Oerlemans et al., 2022).

What the above shows is that each source of external knowledge can provide the firm with some valuable knowledge that could influence their innovation and performance. Therefore, the extent of external knowledge-seeking, especially from multiple sources, will result in a greater inflow of heterogeneous knowledge into the firm (Egbetokun, 2015; Oerlemans et al., 2022). This is core to the resource-based view which is about firms having a bundle of resources. This inflow of knowledge then increases the firm's knowledge or resource base (Alexiev et al., 2010) which would not have been possible had the firm relied on internal sources alone (Knoben & Oerlemans, 2010). With this heterogeneous knowledge, the firm can reconfigure its resources and build internal capabilities to develop strategies to improve its innovation and performance in ways that its competitors cannot imitate. (Flamini et al., 2022; Knoben & Oerlemans, 2010; Sala et al., 2016; Seo, 2020; Tang, 2016). Benefiting from different external knowledge sources helps firms reduce innovation costs and enhances their access to different markets (Goedhuys, 2007; Hydle & Billington, 2020).

Existing studies on open innovation have used different categorizations to capture open innovation practices and how they affect a firm's innovation. For example, Seo (2020) used R&D alliances, Egbetokun (2015) used cooperation resources, Goedhuys

(2007) used collaboration with local partners, and Vega-Jurado et al. (2009) and Ko et al. (2021) used external knowledge sourcing. Despite all these conceptualizations of open innovation, existing literature on external knowledge has focused on two theoretical streams of discussion. The first and most dominant is the literature on how external knowledge affects firm innovation (e.g., Antonelli & Fassio, 2016; Denicolai et al., 2014; Egbetokun, 2015; Gallego et al., 2013; Kesidou & Snijders, 2012; Knoben & Oerlemans, 2010; Medase & Abdul-Basit, 2020; Oerlemans et al., 2022; Omolayo et al., 2014; Pateli & Lioukas, 2019; Vega-Jurado et al., 2009) and to a lesser extent how external knowledge affects performance (e.g., Denicolai et al., 2014; Wang & Chen, 2016). Second, the is literature discussing the moderating factors on the relationship between external knowledge and firm innovation. For example, Baumstark (2020) shows how organizational designs weaken the relationship between external knowledge and firm innovation. Ko et al. (2021) discuss how strategic intent as a contingency factor influences the relationship between external knowledge and firm innovation. Denicolai et al. (2014) discuss how the effect of external knowledge on firm performance is moderated by the degree of internal knowledge (absorptive capacity) within the firm.

The above discussions have motivated this research. First, the above discussions show that while external knowledge is an important determinant of firm innovation and performance, there is limited evidence of existing literature that analyzes innovation as a mediator in the relationship between external knowledge and firm performance. Examining this will empirically test one of the processes through which external knowledge influences firm performance. Second, many of the prominent existing studies have focused more on the developed or emerging markets characterized by efficient institutions that support collaboration and offer assistance for firms to pursue innovation (e.g., Denicolai et al., 2014; Filiou, 2021; Gallego et al., 2013; Vega-Jurado et al., 2009). However, there is very little evidence of such research streams in Africa, despite a few exceptions (e.g., Egbetokun, 2015; Knoben & Oerlemans, 2010; Medase & Abdul-Basit, 2020; Oerlemans et al., 2022; Omolayo et al., 2014). These have however looked at the relationship between external knowledge and firm innovation and more predominantly from a one-country perspective and not how innovation mediates the relationship between external knowledge and firm performance. The mediation effect we seek to explore is shown graphically in Figure 1.

Figure 1 depicts the three conditions for Baron and Kenny's (1986) robust triple test for mediation. There is a direct positive relationship between innovation and firm performance. This positive relationship is because innovative firms can meet customers'

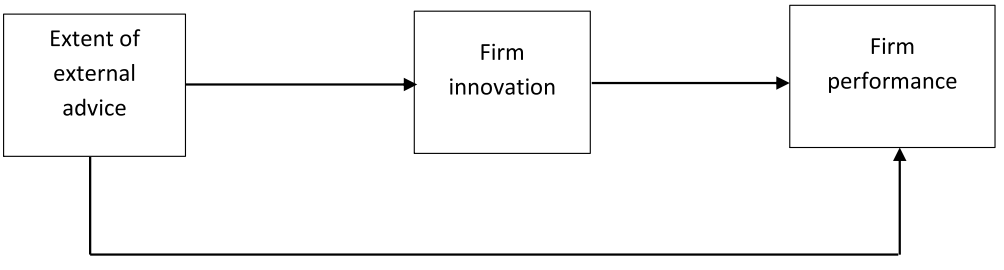

Figure 1. The mediating role of innovation in the relationship between external advice and firm performance.

demand by renewing their products, making them more attractive to their competitors, and the increase in sales, as a result, will increase performance (Najafi Tavani et al., 2013). Moreover, new products could command a premium price due to improved quality and therefore increase the firm's performance (Burrus et al., 2018). Piening and Salge (2015) also highlighted how new products and/or services may be cost-effective and productivity gains may increase the firm's performance. New products and/or services help differentiate the firm's from those of its competitors and this helps improve sales and therefore performance. Moreover, new products may also lead to the emergence of a new market and the firm can benefit from first-mover advantage to improve sales.

Seeking external advice to obtain expert knowledge could be relevant for business management, providing information about market trends and customers' needs, as well as strategic decision-making (Kesidou & Snijders, 2012). The above discussion shows how such knowledge transfer into the firm is a major determinant of the firm's innovation and performance. External advice can therefore have both direct and indirect effects on firm performance through its positive effect on the firm's innovation. The successful introduction of new products and services may require skills and knowledge in developing and marketing the product (Filiou, 2021). Because firms may lack such expertise, they may source advice from external sources in the development and marketing of their product. Such external advice may provide the manager with different perspectives on how the product and/or service can be developed successfully and marketed in the most cost-effective way to improve the firm's performance (Segelod & Jordan, 2004). Firms, therefore, need to be innovative to transform the external knowledge gained into new products and/or services and such innovation will then positively drive performance. However, whether innovation as a mediating variable will have a transformative effect on the relationship between the extent of external knowledge and firm performance is something still to be explored.

3. Research Methods

3.1. The Research Context, Data and Sample

The research context is Africa which is characterized by weak institutional fabrics (Areneke et al., 2019 Areneke & Kimani, 2019;) that could provide opportunities for firms to exploit external knowledge and be more innovative in improving their performance (Burrus et al., 2018). For example, low regulatory enforcement implies firms could import technologies at a cheap cost and imitate other patent innovative products without being penalized, as would happen in the West. At the moment, Africa is one of the fastest growing economies in the world driven by improved governance, internal demand, increased level of trade and foreign investment (Amankwah-Amoah & Medase, 2024). The diffusion of technology is growing with many countries having digital currencies such as e-naira and the use of mobile money for transactions, which are all digitalizing the way firms do business (Ngoasong et al., 2015). All of these have been made possible due to the increased rate of internet penetration and mobile phone usage, with 60% of the African population having mobile phone coverage (ITU, 2009; Wamboye et al., 2015) and a 49% increase in phone subscriptions annually between 2002 and 2007, as compared with 17% per year in

Table 1. Sampled countries.

Country	Number of Firms	Year	Countries	Number of Firms	Year
Cameroon	361	2016	Mali	185	2016
Benin	150	2016	Liberia	151	2017
Chad	153	2018	Niger	151	2017
Côte d'Ivoire	361	2016	Sierra-Leone	152	2017
Guinea	150	2016	Togo	150	2016

Europe (ITU, 2008). This uniqueness of Africa warrants an investigation into whether studies in the West could be applicable in such a context and how.

This research draws on data from the World Bank Enterprise Survey (WBES) for ten SSA countries for the years 2016–2018 based on data availability. Our search reveals only these 10 countries had data on external advice. The WBES has overcome the difficulties of obtaining reliable data, especially in Africa, which has limited existing reliable databases by providing quality and reliable data that can be verified. The quality of the WBES data is seen in its increasing use in management and entrepreneurship research (e.g., Balsmeier and Czarnitzki, 2014; McCann & Bahl, 2017) as the purpose of collecting such data by the World Bank is to gauge the investment climate in emerging markets. The WBES provides a comprehensive and reliable dataset that helps overcome the barriers and difficulties that often result in a low number of administered questionnaires. The WBES collects data from different industries and sectors and on a wide range of variables (Tajeddin and Carney, 2019) (see Table 2).

3.2. Measurement of Variables

The dependent variable is the firm performance which is measured as the log of the firm's annual sales for the last fiscal year. To demonstrate the robustness of the analysis, we used other variables to measure firm performance such as the purchase of fixed assets. For the independent variable, we used dichotomous variables based on the question of whether the firms have used external advice. Specifically, "1" represents the use of external advice and "0", otherwise. The dataset captures external advice from business incubators, the government, suppliers, consumers, and peers/competitors. The mean value of all these sources was used as the measure of the firm's extent of external advice-seeking or knowledge-seeking. The use of binary measures of external advice is well supported within the existing literature (e.g., Alexiev et al., 2010; Baumstark, 2020).

The mediation variable is product innovation. We have measured product innovation based on data on WBES on whether the firm has introduced new products or services over the past three years. This is measured with a dummy variable with "1" = Yes and "0" = No. Even though some may argue that the use of such a binary scale does not distinguish among firms that have introduced, for example ten products from those that have introduced one product, we used another variable for innovation for a robustness test. This research used the main innovative products' total annual sales which we believe compensate for the extent of or the success of the firm's innovation. This value was also log normalized.

It is necessary to control for other variables that can affect performance based on evidence from the existing literature. First, we control for country, industry, year, firm size and legal status fixed effect (McCann & Bahl, 2017). We also control for competition

against unregistered firms. Such competition makes formal firms more innovative as they become competitive for market share. Power outages that are rampant in Africa also affect innovation because the unreliability of electricity will influence the firm's ability to improve innovation and therefore performance. With research showing the disparity in the effect of gender on performance, this research controls for managers' gender (McCann & Bahl, 2017). We control for firms' age measured by taking the difference between when the survey was conducted and when the firm was founded (Alexiev et al., 2010). Older firms tend to have developed networks and social capital which are vital for innovation and improving performance.

This research also controls for whether the firm is a subsidiary as such firms can benefit from external resources of the parent company to innovate and improve performance (Mendi & Costamagna, 2017). Staff training is posited to be a valuable source of human capital development and therefore it is expected firms that provide formal training for their employees enable them to develop skills that may influence their innovativeness which may lead to improved performance (Medase & Abdul-Basit, 2020). Access to finance is a major obstacle for businesses in Africa (Machokoto et al., 2021; Tunyi et al., 2019). Therefore, having a savings account suggests the existence of some financial

Table 2. Variable description.

Variables	Description	Source
Dependent variable		
Annual sales	Log of annual sales for the last fiscal year.	WBES
Independent variable		
External advice	A dummy variable on whether the manager seeks external advice from the following sources with "1" = Yes and "0" = No. This includes business incubators, government, suppliers, consumers, peers and competitors.	WBES
Mediation variable		
Product innovation	A dummy variable on whether the firm has introduced products new to the firm with "1" = Yes and "0" = No, they have not.	WBES
Control variables		
Industry	A categorical variable on the industry sampling sector with "1" = manufacturing, "2" = service and "3" = others.	WBES
Country	A categorical variables with "1" = Cameroon, "2" = Benin, "3" = Chad, "4" = Côte d'Ivoire, "5" = Guinea, "6" = Liberia, "7" = Mali, "8" = Niger, "9" = Sierra-Leone and "10" = Togo.	WBES
Sample size	A categorical variable on the sample size with "1" = small, "2" = medium and "3" = large.	WBES
Firm is part of a large firm	A dummy variable on whether the firm is part of a large firm with "1" = Yes and "0" = No.	WBES
Legal status	A categorical variable on the legal status of the firm with "1" = Shareholding company with shares trade, "2" = Shareholding company with non-shares trade, "3" = Sole proprietorship, "4" = Partnership, "5" = Limited partnership and "6" = Other.	WBES
Firm age	The difference between the year of survey from the year the firm was founded	WBES
Gender of manager	A dummy variable on whether the manager is female with "1" = Yes and "0" = No.	WBES
Formal firms	A dummy variable on whether the firm was registered when it started operation with "1" = Yes and "0" = No.	WBES
Power outages	A dummy variable on whether the firm experiences power outages over the past year with "1" = Yes and "0" = No.	WBES
Competition against unregistered firms	A dummy variable on whether the firm faces competition against unregistered firms with "1" = Yes and "0" = No.	WBES
Savings account	A dummy variable on whether the firm has a savings account with a financial institution with "1" = Yes and "0" = No.	WBES
Formal training	A dummy variable on whether the firm provides formal education to staff with "1" = Yes and "0" = No.	WBES

resources or the ability of the bank to track the firm's financial transactions to facilitate the granting of loans which firms can use to sustain their competitiveness and improve performance. We, therefore, control for staff training and whether the firm has a savings account. The description of all variables is reported in Table 2.

3.3. Addressing Common Method Bias

Survey data are often associated with the possibilities of multicollinearity and common method bias (CMB) occurrences. While many studies have used different ex-post analyses to prove their data do not suffer from CMB, Richardson et al. (2009) argued what is important is for researchers to develop a robust design to collect reliable data as no amount of ex-post analysis can compensate for a poor research design. We, therefore, suggest the following reasons why the data collection process used by the WBES is robust enough to minimize issues of CMB. First, WBES guarantees the anonymity and confidentiality of participants and their responses. There is transparency in the questions asked with no ambiguous terminologies used that could prevent respondents from understanding their meaning. The language used in each country is the language understood by the participants. Such a process minimizes the occurrences of CMB because participants are more willing to engage by providing honest responses (Maula & Stam, 2020).

Second, there is no possibility that respondents could know the framework developed in this research when responding to the survey to establish relationships in their responses (Pateli & Lioukas, 2019). Moreover, with more than 50 questions with different measurement scales, the cognitive ability of the respondents to establish relationships is greatly reduced. All these factors minimized the possibility of CMB (Podsakoff et al., 2012). Lastly, to address ex-post analysis, we computed the mean-variance inflation factor (VIF) for each model and the values suggest they are all within an acceptable range of 0–5 (Tabachnick & Fidel, 2001) and therefore conclude that the data used for this research do not suffer from CMB.

4. Data Analysis and Results

To analyze the mediating effect of firm innovation on the relationship between external advice and firm performance, this research adopted Baron and Kenny's (1986) triple test for mediation. The first requirement of the test is that the independent variable (external advice) should predict the mediator variable (firm innovation). The second requirement is that the effect of external advice on firm performance is significant in the absence of the mediator (firm innovation). Finally, when the mediator is introduced together with the independent variable, the effect of the independent variable on the dependent variable should decrease in magnitude or even disappear. We have used the following equation to test for mediation as follows:

$$Innovation = \beta_0 + \beta_1 EAij + \beta_2 Cij + vj + E_i \quad (1)$$

$$Performance = \beta_0 + \beta_1 EAij + \beta_2 Cij + vj + E_i \quad (2)$$

$$Performance = \beta_0 + \beta_1 EA + \beta_2 INOij + \beta_3 Cij + vj + E_i \quad (3)$$

From the above equations, β_0 represents the constant, β_1, β_2 and β_3 are the coefficients of the independent variable (external advice), mediator (innovation) and control variables respectively, and *E* is the error term. AE and INO are external advice and innovation. ij for a firm in a specific country. Table 3 presents the descriptive and correlation statistics.

The analysis is based on a mixture of both Probit and OLS hierarchical regressions. The use of the Probit model was to examine the effect of external advice on firm innovation since the latter is a dummy variable and thus best fits with Probit models. This research uses OLS to test the mediation due to the dependent variable being a continuous variable. The starting point of the analysis was to regress the control variables against firm innovation and performance to examine an alternative explanation of the direct effects of the independent variable on the dependent variable as shown in Table 4, Models 1 and 2. In the second stage, external advice was included in the control variables and regressed against firm performance (Table 4, Model 3). In the third stage, external advice was included in the control variables and regressed against firm innovation excluding the mediation variable (Table 4, Model 4). The fourth stage involves the effect of innovation on firm performance (Table 4, Model 5). In the final stage, we included external advice and the mediator (innovation) and regressed against firm performance (Table 4, Model 6).

Reading from Table 4, Model 4, the result suggests that external advice has a significant positive relationship with firm innovation ($\beta = 0.193$, SE = 0.07; $P = 0.006$) which supports the first condition for the triple mediation test. The results imply a unit increase in external advice will increase the firm's innovation by 0.19.

The second condition for the triple test of mediation was that external advice would have a positive relationship with firm performance. Table 4, Model 3 confirms this condition ($\beta = 0.578$, SE = 0.09; $P = 0.000$). This implies that a unit increase in the firms seeking external advice will lead to a 0.58 increase in the firm's performance.

Finally, to determine whether firm innovation mediates the relationship between external advice and firm performance, this research tests the full model which takes into account the effect of external advice, the mediator (firm innovation) and all control variables as in Equation 3. Equation 3 suggests for mediation to occur, it is necessary for both external advice and innovation to influence firm performance and the model should also show that there is a decrease in the coefficient of external advice when firm innovation is introduced into the model. Table 4, Model 6 shows that external advice and firm innovation are both positive and significantly associated with firm performance ($\beta = 0.567$, SE = 0.9; $P = 0.000$: $\beta = 0.199$, SE = 0.9; $P = 0.036$). Even though there was a decrease in the coefficient of the effect of external advice on firm performance in Table 4, Model 6 compared to Table 4, model 3, this decrease was still positively significant and not negative and non-significant. On this basis, we, therefore, conclude that there is a partial mediation by firm innovation.

4.1 Robustness Check

We have used a series of techniques to test the robustness of our findings. First, we have used different measures of innovation and performance as shown in Table 5 and the results are still significant. Second, despite using Baron and Kenny (1986) to examine

Table 3. Descriptive and correlation statistics.

	1	2	3	4	5	6	7	8
Product innovation (1)	1.000							
External advice (2)	0.141***	1.000						
Industry (3)	−0.022	0.010	1.000					
Country (4)	0.001	0.015	−0.026	1.000				
Firm size (5)	0.051**	0.139***	−0.035	−0.101***	1.000			
The firm is a subsidiary (6)	0.093***	0.094***	0.091***	0.037	0.194***	1.000		
Legal status (7)	−0.036	−0.014	−0.021	0.008	−0.116***	−0.035	1.000	
Firm age (8)	0.038	0.062**	−0.016	−0.110***	0.210***	0.025	−0.033	1.000
Managers gender (9)	0.035	0.060**	0.061**	−0.003	−0.102***	−0.055**	0.064***	−0.046*
Formal firms (10)	0.028	0.056**	0.000	−0.008	0.162***	0.065***	−0.105***	0.003
Power outages (11)	0.058**	0.080***	0.046*	−0.113***	0.078***	0.020	−0.103***	0.086***
Firm compete against unregistered firms (12)	0.059**	−0.016	0.089***	−0.074***	−0.101***	0.003	0.035	0.023
Firm has savings account (13)	0.125***	0.186***	0.010	0.085***	0.164***	0.109***	−0.049**	0.087***
Staffs are formally trained (14)	0.198***	0.243***	0.060**	−0.053**	0.171***	0.066***	−0.143***	0.081***
N	1953	1943	1964	1964	1964	1964	1960	1921
Mean	0.362519	0.354606	1.886965	4.86609	1.574847	0.308554	2.62551	17.21655
SD	0.480851	0.478517	0.741364	2.889877	0.723662	0.462014	1.031689	12.12465
Min	0	0	1	1	1	0	1	1
Max	1	1	3	10	3	1	6	64

Notes: Robust *P* Values; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 4. Results of the analysis.

Variables	(1) Innovation	(2) Performance	(3) Performance	(4) Innovation	(5) Performance	(6) Performance
A subsidiary firm	0.218***	0.704***	0.661***	0.209***	0.689***	0.649***
	(0.003)	(0.000)	(0.000)	(0.004)	(0.000)	(0.000)
Firm age	0.001	0.029***	0.029***	0.001	0.029***	0.029***
	(0.613)	(0.000)	(0.000)	(0.595)	(0.000)	(0.000)
Managers gender	0.183*	0.133	0.087	0.172*	0.114	0.071
	(0.066)	(0.299)	(0.484)	(0.084)	(0.378)	(0.573)
Formal firms	0.012	0.758***	0.746***	0.019	0.757***	0.745***
	(0.892)	(0.000)	(0.000)	(0.839)	(0.000)	(0.000)
Informal competition	0.194***	−0.161	−0.149	0.187**	−0.176*	−0.163
	(0.009)	(0.130)	(0.154)	(0.012)	(0.097)	(0.120)
Savings account	0.265***	0.830***	0.774***	0.245***	0.806***	0.754***
	(0.001)	(0.000)	(0.000)	(0.002)	(0.000)	(0.000)
Staff training	0.469***	0.512***	0.375***	0.427***	0.469***	0.341***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
Power outages	0.200**	0.309**	0.273**	0.199**	0.292**	0.259**
	(0.030)	(0.015)	(0.033)	(0.031)	(0.021)	(0.042)
Legal status effect	Yes	Yes	Yes	Yes	Yes	Yes
Firm size effect	Yes	Yes	Yes	Yes	Yes	Yes
Country effect	Yes	Yes	Yes	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes	Yes	Yes	Yes
External advice			0.578***	0.193***		0.567***
			(0.000)	(0.006)		(0.000)
Product innovation					0.234**	0.199**
					(0.014)	(0.036)
Constant	−0.731***	15.968***	15.853***	−0.773***	15.910***	15.807***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	1,718	1,551	1,542	1,709	1,550	1,541
R-squared	N/A	0.724	0.732	N/A	0.725	0.733
Wald chi2	140.73	N/A	N/A	146.18	N/A	N/A
Prob > chi2	0	0	0	0	0	0
Mean VIF	2.1	1.36	1.36	2.09	1.35	1.35

Notes: Robust *P* Values in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

	9	10	11	12	13	14
Managers gender (9)	1.000					
Formal firms (10)	0.016	1.000				
Power outages (11)	0.011	0.121***	1.000			
Firm compete against unregistered firms (12)	0.006	−0.058**	0.061**	1.000		
Firm has savings account (13)	−0.044*	0.090***	0.138***	0.011	1.000	
Staffs are formally trained (14)	0.020	0.089***	0.096***	−0.005	0.145***	1.000
N	1960	1932	1957	1861	1870	1937
Mean	0.121429	0.849896	0.811957	0.739925	0.235294	0.303046
SD	0.326708	0.357265	0.390846	0.438793	0.424296	0.459694
Min	0	0	0	0	0	0
Max	1	1	1	1	1	1

Notes: Robust *P* Values; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

the mediation effect of innovation on the relationship between external advice and firm performance, we acknowledge that this triple test of mediation does not report the bias-correlated confidence interval and the size of the direct, indirect and total effect. However, this test of mediation is still valid as it helps us understand the specific nature of the

Table 5. Robustness check.

Variables	(1) R&D Expenditure	(2) Fixed Asset	(3) Fixed Asset	(4) R&D Expenditure	(5) Fixed Asset	(6) Fixed Asset
A subsidiary	0.096	0.174**	0.158**	0.070	0.168**	0.149**
	(0.299)	(0.016)	(0.031)	(0.451)	(0.021)	(0.043)
Firm age	−0.000	0.000	−0.000	−0.000	−0.000	−0.000
	(0.951)	(0.993)	(0.932)	(0.942)	(0.985)	(0.898)
Manager's gender	−0.132	−0.045	−0.066	−0.171	−0.052	−0.073
	(0.377)	(0.650)	(0.513)	(0.261)	(0.602)	(0.471)
Formal firms	0.009	−0.140	−0.153*	0.003	−0.148	−0.160*
	(0.942)	(0.121)	(0.092)	(0.982)	(0.101)	(0.078)
Informal competition	0.087	−0.002	0.008	0.105	−0.004	0.009
	(0.354)	(0.972)	(0.917)	(0.264)	(0.959)	(0.903)
Savings account	0.109	0.418***	0.385***	0.050	0.419***	0.388***
	(0.255)	(0.000)	(0.000)	(0.603)	(0.000)	(0.000)
Staff training	0.495***	0.367***	0.307***	0.416***	0.346***	0.290***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Power outages	0.210*	0.097	0.075	0.186	0.088	0.069
	(0.099)	(0.272)	(0.397)	(0.147)	(0.320)	(0.434)
Legal status effect	Yes	Yes	Yes	Yes	Yes	Yes
Firm size effect	Yes	Yes	Yes	Yes	Yes	Yes
Country effect	Yes	Yes	Yes	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes	Yes	Yes	Yes
External advice			0.299***	0.428***		0.289***
			(0.000)	(0.000)		(0.000)
Firm spends on R&D					0.229**	0.181*
					(0.026)	(0.085)
Constant	−1.455***	−0.419**	−0.465**	−1.560***	−0.403**	−0.448**
	(0.000)	(0.021)	(0.011)	(0.000)	(0.028)	(0.015)
Observations	1,710	1,717	1,708	1,702	1,705	1,697
R-squared	N/A	0.737	0.741	N/A	0.737	0.741
Wald chi2	114.51	N/A	N/A	130.24	N/A	N/A
Prob > chi2	0	0	0	0	0	0
Mean VIF	2.1	1.36	1.36	2.09	1.35	1.35

Notes: Robust *P* value in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

mediation (Zhao et al., 2010). We further address this by using the product of coefficient approach (MacKinnon et al., 2002) to compute three different tests of mediation. These tests include the Sobel test and Aroian and Goodman tests. While these tests have been found confirm our initial results, Preacher and Hayes (2004) suggest the use of bootstrapping. We conducted the bootstrapping analysis using the Sobel-Goodman tests to verify the effect size of the mediation (see Table 6).[1]

Despite the Sobel test confirming the existence of the mediation effect, they are found to have low statistical power. Studies have therefore overcome this using bootstrapping which enables us to obtain standard errors, *p* values and confidence intervals (Preacher & Hayes, 2004). Table 8 presents the results of the bootstrapping. The result still provides strong evidence of mediation.

Table 6. Sobel-Goodman mediation tests.

	Est	Std_err	z	*P* Value
Sobel	0.030	0.012	2.386	0.017
Aroian	0.030	0.013	2.336	0.019
Goodman	0.030	0.012	2.439	0.015

Table 7. Indirect, direct and total effect.

	Est	Std_err	Z	*P* Value
a_coefficient	0.081	0.025	3.161	0.002
b_coefficient	0.367	0.101	3.638	0.000
Indirect_effect_aXb	0.030	0.012	2.386	0.017
Direct_effect_c'	0.745	0.102	7.292	0.000
Total_effect_c	0.775	0.102	7.575	0.000

Table 8. Bootstrap result.

	Observed coefficient	Bootstrap Std. err	Z	*P* Value	Normal-based [95% conf. interval]	
Indirect effect	.0295401	.0124125	2.38	0.017	.005212	.0538682
Direct effect	.7451571	.0992153	7.51	0.000	.5506987	.9396156
Total effect	.7746972	.099086	7.82	0.000	.5804922	.9689023

Finally, an issue that can affect our reported results is endogeneity. Specifically, recent studies have noted the presence of endogenous relationships between variables (Rohrer et al., 2022, Areneke et al., 2023). Accordingly, endogeneity may be a result of omitted variables, reverse causality and dynamism of variables (Areneke et al., 2023; Areneke & Tunyi, 2022). Given the cross-sectional nature of our variables, dynamic endogeneity is unlikely to be an issue as it is relatively important when using panel data. However, omitted variable bias may affect the direct effect of external advice on performance. As noted by Lynch and Brown (2011), a method to address omitted variable bias is to test for mediators (indirect effect). Given our estimation is the mediating role of innovation on the association between external advice-seeking and performance, our analysis thus unpacked the importance of mediators in addressing omitted variable bias that can lead to spurious coefficients. Accordingly, we reported the total effect of external advice which is explained by innovation (indirect effect) and the direct effect as shown in Tables 7 and 8. Specifically, these tables show that the omission of important mediators such as innovation in examining the link between external advice and performance (as done in prior research), leads to omitted variable bias which we have addressed in the study. Concerning reverse causality, as argued by Lynch and Brown (2011), it is virtually impossible to address simultaneity using cross-sectional data since all variables are measured simultaneously. However, we performed a first-stage instrumental variable test (also known as the Hausman test) by using external advice as the dependent variable regressed against performance and the other control variables. This result[2] shows performance does not significantly affect external advice which suggests reverse causality is unlikely to be an issue in our estimation. Overall, these robustness checks suggest our results are unlikely to be spurious due to endogeneity.

5. Discussion

This research aimed to examine the mediation effect of firm innovation on the relationship between external knowledge and firm performance using Baron and Kenny's (1986) triple test for mediation, the product of the coefficient approach (MacKinnon et al., 2002) to compute three different tests of mediation (the Sobel, Aroian, and Goodman tests) and the bootstrap confidence interval (Preacher & Hayes, 2004). In

other words, this research examines innovation as a mechanism through which external knowledge could influence firm performance in a developing economy context. To test the mediation effect, this research used data from the WBES on ten SSA countries. The results from the different analyses confirm the test of mediation.

The first condition as shown in equation 1 above is that the independent variable (external advice) should positively influence the mediator variable (innovation). The result in Table 4, Model 3 confirms this first condition. The positive effect of external knowledge and firm innovation is also supported in the existing literature (e.g., Antonelli & Fassio, 2016; Pateli & Lioukas, 2019), including other studies in Africa (e.g., Egbetokun, 2015; Medase & Abdul-Basit, 2020; Knoben & Oerlemans, 2010; Omolayo et al., 2014). This relationship confirms how external knowledge from different sources represents a bundle of resources as per the RBV that firms can use to sustain their competitiveness via innovation. External knowledge is a strategic resource that flows into the firm. This knowledge includes knowledge from suppliers, customers, competitors, and government, among others (Knoben & Oerlemans, 2010). Such knowledge comes from actors who understand market dynamics and changing trends, and thus the type of information they provide firms is of strategic importance (Medase & Abdul-Basit, 2020). When such knowledge flows into firms, it increases their knowledge base and the learning processes within them (Seo, 2020; Tang, 2016). The extent of knowledge-seeking implies the firm benefits from heterogeneous knowledge to develop strategies to drive innovation and performance in such a way that its competitors cannot imitate these (Alexiev et al., 2010).

The second condition of the triple test for mediation as shown in equation 2 above is that the mediator (firm innovation) should positively predict the dependent variable (firm performance). The results in Table 4, Model 5 confirm this condition. The positive relationship between firm innovation and performance is also supported by studies in the existing literature (e.g., Najafi Tavani et al., 2013; Piening & Salge, 2015). There are several reasons that can explain this positive relationship. First, innovation introduces some variables which may make the product more attractive to consumers and such attractiveness will increase sales and performance. Second, innovative products and/or services may be of premium quality and therefore command a high price (Burrus et al., 2018). Developing a quality product is key to sustaining a competitive advantage in the marketplace. Customers want quality products and will therefore happily pay a premium for them, and this high price increases firm performance. Third, innovation may lead to productivity gains due to cost minimization and differentiation. Firms may produce quality products using a cost-effective strategy and being able to differentiate their products from that of their rivals makes them more appealing to consumers.

The third condition for the triple test for mediation as shown in equation 3 above is also confirmed. When external knowledge was regressed on firm performance together with firm innovation, the effect of external knowledge on firm performance decreased. This decrease is compared to the original coefficient of external knowledge in equation 2. The decrease in the magnitude of external knowledge in equation 3 shows that the introduction of innovation into the equation was pulling some of the value of external knowledge on firm performance. What this result demonstrates is that there is a process through which firms can benefit from external knowledge to improve their performance and that process is innovation. Without innovation, it will be difficult for firms to

maximize the benefit of external knowledge as such knowledge by itself does not create a competitive advantage. External knowledge becomes useful only when firms can combine such knowledge with their internal resources, learn from such knowledge and use this knowledge to develop skills and expertise to introduce innovations to rival their competitors. It is in light of the success of these innovations, therefore, that external knowledge could positively influence firm performance.

5.1. Contribution

This research explains the process through which external knowledge could have a positive effect on firm innovation in Africa. This research introduces innovation as a mechanism or process through which external knowledge could have a positive effect on firm performance. To test for the mediating role of innovation, the Baron and Kenny (1986) triple test for mediation was used as explained in equations 1, 2 and 3 above. This research builds on the RBV on the role of external knowledge on firm performance and contributes to the existing literature in several ways.

First, our findings contribute to the literature on improving firm performance by showing that innovation serves as a transformative mechanism through which external knowledge could influence firm performance. This research is of significance because even though research exists to suggest that a high level of external knowledge influences firm performance (Piening & Salge, 2015), the transformative mechanism through which this occurs has not been extensively examined. This study shows that it is the ability of firms to exploit and transform this knowledge into new products and/or services that drives firm performance. The test for innovation as a mediation variable in the external knowledge and firm performance relationship is an added contribution to studies that have either examined the effect of external knowledge on innovation or performance (Egbetokun, 2015; Medase & Abdul-Basit, 2020) and the effect of innovation on performance (Piening & Salge, 2015). From the RBV perspective, a high level of external knowledge increases the firm's resource base and resource heterogeneity has been a distinguishing competitive factor influencing firm performance. What this research suggests is that external knowledge is a strategic resource that is valuable for firm performance even in the African context and for a couple of reasons. Seeking external advice is important in an African context because many SMEs lack the capability for in-house R&D and human capital development (e.g., limited staff training) is low compared to large firms or other firms in developed contexts (Omolayo et al., 2014). Limited human capital in Africa is associated with low educational system quality which affects the labor force available for entrepreneurial activities (Urban & Kujinga, 2017). In addition to these, Egbetokun (2015) also highlights that infrastructure and institutions required for learning and capability building are constrained; consequently, seeking external knowledge is a viable means for firms to obtain expert advice for innovation.

SMEs in Africa will therefore need to search externally from different knowledge sources to derive information that can enable them to improve their performance through innovation. However, it is the number of sources, or the level of knowledge obtained from different sources that matters rather than specific sources because the RBV argues for resource heterogeneity. Knowledge from different sources provides the firm with complementary ideas for innovation. For example, suppliers' knowledge is

critical for innovation because they provide businesses with a fair assessment of any proposed innovation and are responsible for sourcing innovation inputs (Becker & Gassmann, 2006). There has been a growth of business incubators in Africa (Ngoasong et al., 2015). Business incubators provide significant business support to small businesses such as access to business finance, developing business infrastructure, market analysis and product development. For many SMEs with limited capability, business incubators provide a source of support to grow their business. Information from the customer is also very important because they are the consumers of the product and or service (Najafi Tavani et al., 2013). Customer feedback therefore plays an important role in product and or service development which subsequently influences firm performance. The role of business consultancy as a source of external knowledge cannot be ignored. Consultancy services provide firms with expert knowledge and can help advise firms about their internationalization strategies via market-specific knowledge such as how to build and manage alliances. Africa is characterized by inefficient institutions and poor clarity for the enforcement of the rule of law. Seeking advice from government agencies could help firms understand policy specifications and how they are enforced, which could adversely affect their performance because an absence of policy adherence could increase transactions costs.

The positive effect of external knowledge and firm innovation and performance is a confirmation of the RBV theory about the value of different bundles of resources for firm innovation and performance as the extent of resource availability distinguishes innovative from non-innovative firms (Filiou, 2021). This research complements the above existing literature by showing how firm innovation could be a mechanism through which external knowledge influences firm performance in a developing country. What this means is that innovation is a viable means by which firms demonstrate their benefit of seeking external advice or knowledge. Without reconfiguring this external knowledge in a unique way to bring about innovation in products and/or services, such external knowledge will not be of value to the firm. The contribution of a mediation effect therefore extends the limited studies on external knowledge and firm innovation, especially in Africa, that have focused more on the link between external advice and firm innovation (e.g., Egbetokun, 2015; Goedhuys, 2007; Knoben & Oerlemans, 2010; Medase & Abdul-Basit, 2020; Omolayo et al., 2014).

Second, by focusing on the African continent, this research shows how existing studies on external knowledge from advanced economies can be valid for less-developed economies like those in Africa. By showing this, we therefore align theory to context (Marcotte, 2014; Urban & Kujinga, 2017; Zoogah et al., 2015). For countries like those in Africa, external knowledge can be a valuable resource for firms and the inadequate resources, R&D and poor institutional fabric could explain why seeking external knowledge could provide firms with a competitive advantage by enabling them to increase their knowledge and capability base and empowering them to be more competitive via innovation and improving their performance.

Third, while existing studies have focused more on one country analysis and specific types of firms such as manufacturing and technology firms (e.g., Egbetokun, 2015; Knoben & Oerlemans, 2010; Medase & Abdul-Basit, 2020; Omolayo et al., 2014), such contributions are limited due to inadequate generalizability of the findings to other contexts. This research overcomes the above limitation by using data from ten SSA countries (see

Table 1) which, though similar in context, are at different stages of growth. The data used also consist of firms from different sectors (manufacturing, service, retail and others). This implies the contribution of this research can be generalized to other African countries and therefore have broader policy and practical implications for Africa.

5.2. Research Implications

Research has shown that in a resource-poor context such as Africa, firm pursuing innovation without collaborating with other firms or external stakeholders have a high probability of failure due to resource and knowledge deficiency (Egbetokun, 2015). This research, therefore, informs managers about the need to seek external advice from diverse sources and use this heterogeneous knowledge to complement their internal capacities. Moreover, this research informs managers that external knowledge in itself does not translate into increased performance. For this to be possible, the firms need to use this knowledge to introduce innovation, the benefits of which can then improve their performance.

From a policy perspective, what this research shows is that collaboration is good for firms, and when firms are performing well, it could have a multiplier effect on the economy in terms of growth. Making it easier for different actors to share knowledge should be a priority policy for policymakers in developing economies like those in Africa. RBV posits that firms need a bundle of resources to be competitive; therefore, policymakers should encourage the growth of research institutions, business incubators and other business service providers so that firms can have a range of opportunities to seek external knowledge for their growth. One possible way is for policymakers to organize some routine networking sessions where various actors such as producers, consumers, incubators, and government officials among others meet with small business owners to discuss market trends, opportunities, and challenges and build lasting relationships (Gallego et al., 2013). This is important because many small businesses do not have the resources to contact these actors and thus, by organizing such networking sessions, they would have the opportunity to meet different actors and learn from each other.

5.3. Limitations and Future Research

In this research, we have used a robust method to show how firm innovation mediates the relationship between external knowledge and firm performance in developing countries contexts (i.e., the African case). However, there are avenues for further research. First, one characteristic of seeking external knowledge is that firms get to build a relationship and can benefit as a result of being embedded in such a relationship. Embeddedness, however, can facilitate or constrain the firm's ability to use the embedded knowledge. It could be interesting for further research therefore to show how such knowledge can be constrained in developing country contexts like those in Africa. Second, the behavior of firms can be best understood concerning their institutional context. Given the complexity of the institutional fabric in Africa, further research needs to examine how characteristics of its institutional fabric such as corruption and regulations of property rights, among others, can moderate the relationship between external knowledge and firm innovation. Third, a reverse causal investigation, which is scarce in existing studies, could provide interesting findings (Baumstark, 2020). For example, exploring firm performance

and innovation as determinants for the firm's ability to seek external knowledge could help explain whether successful firms are those that seek advice or not.

Notes

1. For brevisity, we report only the effect size of the mediation.
2. Due to space constraints, we have not provided the Table of this result. The Table is, however, available upon request.

Disclosure Statement

No potential conflict of interest was reported by the authors.

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