SME FINANCING, PERFORMANCE, AND INNOVATION IN DEVELOPING COUNTRIES – THE IMPACT OF THE INSTITUTIONAL AND REGULATORY BUSINESS ENVIRONMENT IN AFRICA

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ABSTRACT

Small and medium enterprises (SMEs) contribute enormously to the industrial output and export of goods and services in developing countries and play a significant role as the engine of growth in these countries, accounting for large proportions of manufacturing and general employment. However, SMEs in developing countries tend to be financially constrained, less productive, pay lower wages, and are less likely to introduce new products and services than large firms. While it is known that some elements of the business environment (BE), such as weak macroeconomic conditions, are to blame for the peculiar challenges faced by SMEs in developing countries, very little is known about the influence of other elements of the BE (such as institutions) on the operations and financial performance of SMEs. Consequently, this PhD thesis aims to explore how some elements within the BE – such as institutions, the regulatory business environment (RBE), and innovation systems – impact (1) access to finance and funding choices; (2) the financial performance; (3) the funding choices – financial performance relationship, and (4) the innovation profiles and output of SMEs in Africa. Using a rich panel sample of 39,461 firm observations (27 African countries) from the World Bank Enterprise Surveys and employing panel regressions, Propensity Score Matching (PSM), and Structural Equation Modelling (SEM) methods, these findings were noted: First, the supply of external finance increases in African countries with enabling institutional and RBEs, however, this increased supply of finance does not translate to greater patronage by SMEs. Second, not all dimensions of an enabling RBE enhance the performance of SMEs in African countries. While an enabling business licensing and tax administration environment improves the performance of

SMEs, trade facilitation impedes the performance of SMEs due to their limited capacity to compete with foreign firms and financial constraints. Third, working capital funding from internal sources (such as owners, family, and friends, and retained earnings) and trade credit results in weaker financial performance for SMEs in African countries, while working capital funding from financial institutions (banking and non-banking) results in stronger financial performance for SMEs in African countries. Fourth, SMEs in African countries are more likely to adopt DUI (innovation based on learning-by-doing, by-using, and by-interacting) drivers than STI (science, technology, and innovation) drivers due to their specific institutional and innovation environment. Fifth, SMEs that adopt a combination of STI and DUI drivers are more effective at generating business process (or non-technological) innovations than product (or technological) innovations. And sixth, financial constraints have a greater effect on the generation of product innovations than on business process innovations for SMEs in Africa. These findings indicate the need to tailor policies and interventions aimed at improving specific elements of regulatory institutions and innovation systems, since these institutional elements have profound impact on the operations, innovation, and financial performance of SMEs in African countries.

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DECLARATION

This thesis is submitted in fulfilment of the requirements for the degree of Doctor of Philosophy (Management) at the Bournemouth University, United Kingdom. I declare that this thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that this thesis has not been previously or concurrently submitted, either in whole or in part, for any other qualification at the Bournemouth University or other institutions.

Andrew Emmanuel Hansen-Addy

June 2021

DEDICATION

This work is dedicated to my loving wife, Sandra, and my lovely daughters, Belita and Beryl, who have been at my side throughout this journey.

LIST OF ABBREVIATIONS AND ACRONYMS

BE	-	Business environment
DUI	-	Innovation based on learning-by-doing, by-using, and by-interacting
EU	-	European Union
ILO	-	International Labour Organization
OECD	-	Organisation for Economic Co-operation and Development
R&D	-	Research and development
RBE	-	Regulatory business environment
STI	-	Science and technology-based innovation
SME	-	Small and medium-sized enterprise
WBES	-	World Bank Enterprise Surveys

CHAPTER ONE – INTRODUCTION

1.1 CHAPTER OVERVIEW

This chapter introduces this integrated PhD thesis. It provides the motivations for this study and outlines how the thesis is structured around 4 papers.

1.2 RESEARCH BACKGROUND

It is widely acknowledged that small and medium-sized enterprises (SMEs) contribute enormously to the industrial output and export of goods and services worldwide (Ayyagari et al. 2007; Danuta 2015; Karadag 2015; ILO 2019; World Bank 2021b). They particularly play a significant role as the engine of growth in developing countries accounting for about 70% of GDP, 85% of manufacturing employment, and 75% of general employment (Beck et al. 2005a). Moreover, SMEs have the potential to fortify economic progress in developing countries. For instance, Ayyagari et al.'s study (based on 104 developing countries), noted that SMEs have the largest proportion of job creation, and the highest sales and employment growth in developing countries (Ayyagari et al. 2014). This capacity is widely confirmed (Li et al. 2012; World Bank 2016; Ayyagari et al. 2017; Kersten et al. 2017).

Nevertheless, while SMEs contribute enormously to the economic fabric in developing countries, they tend to be less productive, pay lower wages, and are less likely to introduce new products and services than large firms (World Bank 2013; ILO 2019) – see Fig 1. The International Finance Corporation (IFC) estimates that about 40% of SMEs in developing countries do not have access to sufficient finance to operate, stifling their growth and economic potential (IFC 2017). Moreover, SMEs in

developing countries have an unmet financing need of 5.2 trillion USD each year which is about 1.4 times the current annual global supply of finance to SMEs (World Bank 2021b) – see Fig 2.

Among the numerous developing countries worldwide, African countries[1] have been of great interest to policy makers and scholars in recent times (Dana et al. 2018). This is because African countries present a unique yet challenging context for entrepreneurship. For instance, despite the detrimental economic effects of the COVID-19 pandemic, the World Bank estimates that real gross domestic product (real GDP) in sub-Saharan Africa will grow by 2.8% in 2021, and 3.3% in 2022 which is just marginally lower than estimates for Europe and Central Asia[2] (World Bank 2021c). Nevertheless, African countries are plagued with enormous challenges. For instance, the African business environment is considered one of the poorest regions in the world with an Ease of Doing Business (EODB) average score of 51.8, far below the global average of 63.0 (World Bank 2020a). Moreover, the World Bank emphasises that despite a unique opportunity to gain high returns from investment in innovation activities, many developing countries (such as those in Africa) are investing less in innovation than richer nations, leading to low growth rates and fewer available jobs for their ever-growing populations (World Bank 2017). Access to finance

[1] The entrepreneurial context in African countries are very similar (with some variations) to other developing countries (Aterido and Hallward-Driemeier 2010). For instance, access to finance constraints is a pressing issue for firms in developing countries in Africa (Fowowe 2017), Asia (Inoue and Hamori 2016; Kumarasamy and Singh 2018), and Latin America (Presbitero and Rabellotti 2016). However, the business environment in Sub-Saharan Africa is considered the poorest in the developing world with an Ease of Doing Business (EODB) average score of 51.8, compared to 59.1 in Latin America and Caribbean, 60.2 in the Middle East and North Africa, and 63.3 in East Asia and Pacific (World Bank 2020a).

[2] 3.9% (2021 and 2022)

challenges (Fowowe 2017), high youth unemployment (Chigunta 2017), corruption (d'Agostino et al. 2016), crime (Wannenburg 2005), weak institutions (Alhassan and Kilishi 2019), and inadequate infrastructure (Bond 2016) are some pressing limitations in Africa which are nonetheless common to many developing countries (Agarwal and Mohtadi 2004; Dollar et al. 2005; Beck 2007; Mair and Marti 2009; Gnangnon 2019; Amirapu and Gechter 2020; Nasrallah and El Khoury 2021).

However, scholarly literature points to entrepreneurship as a tool to alleviate some of the enormous challenges facing developing countries in Africa (Naudé 2010). Bruton et al. (2013) noted that promoting entrepreneurship in poor countries had the potential to alleviate poverty. Kimhi (2009) observed that income obtained by entrepreneurs in Ethiopia reduced substantially per capita household inequality in Ethiopia. Nafukho and Muyia (2010) also argued that entrepreneurship education and training were essential in reducing unemployment in Kenya.

In this regard, some scholars have shed light on the business environment in Africa and its impact on entrepreneurship and firms. Madzikanda et al. recently argued that unhealthy entrepreneurial ecosystems hindered economic output and entrepreneurship in southern African countries. Additionally, Sheriff and Muffatto (2015) noted that weak entrepreneurship environments (ecosystems) in African countries seem to be responsible for poor entrepreneurship in Africa. Using institutional theory, Atiase et al. (2018) noted that effective (regulatory) institutions such as political governance, and contract enforcement are needed to support SMEs and entrepreneurship in Africa. Furthermore, Abubakar (2015) noted that the unfavourable investment climate, and

unavailability of entrepreneurship training impede entrepreneurship development in Africa. Nevertheless, African countries that implement economic reforms and macroeconomic management, experience an improved investment climate that promote greater entrepreneurship (Ahmed and Nwankwo 2013). Thus, Galperin and Melyoki (2018) argued that entrepreneurship policy implementation seems to be the missing link in improving the entrepreneurial ecosystem in Tanzania to support entrepreneurship.

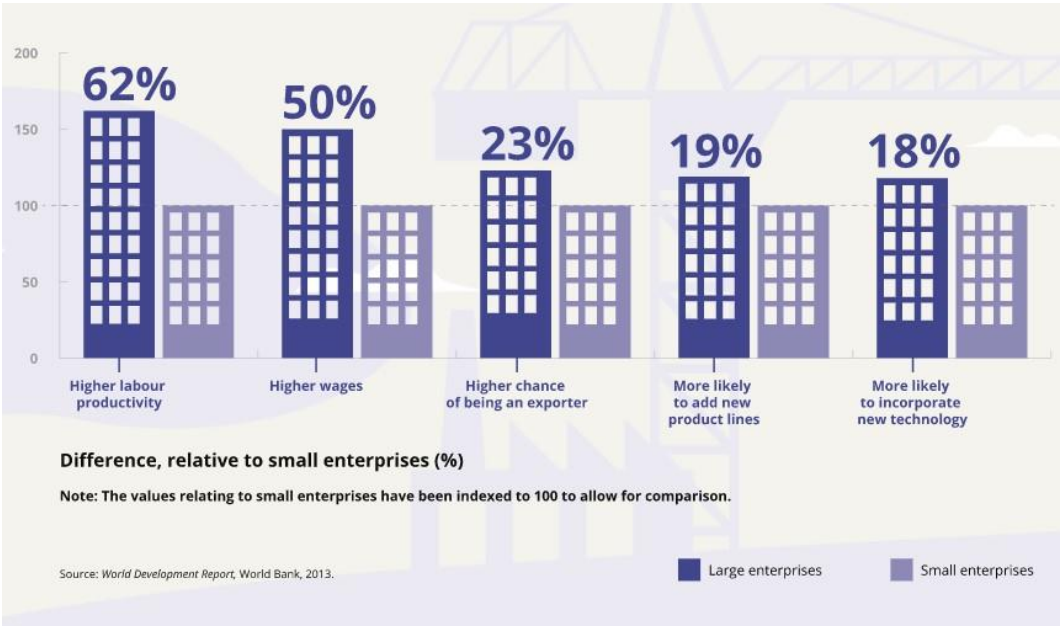


Figure 1. Productivity of SMEs vs. large firms

Source: World Bank (2013), ILO (2019)

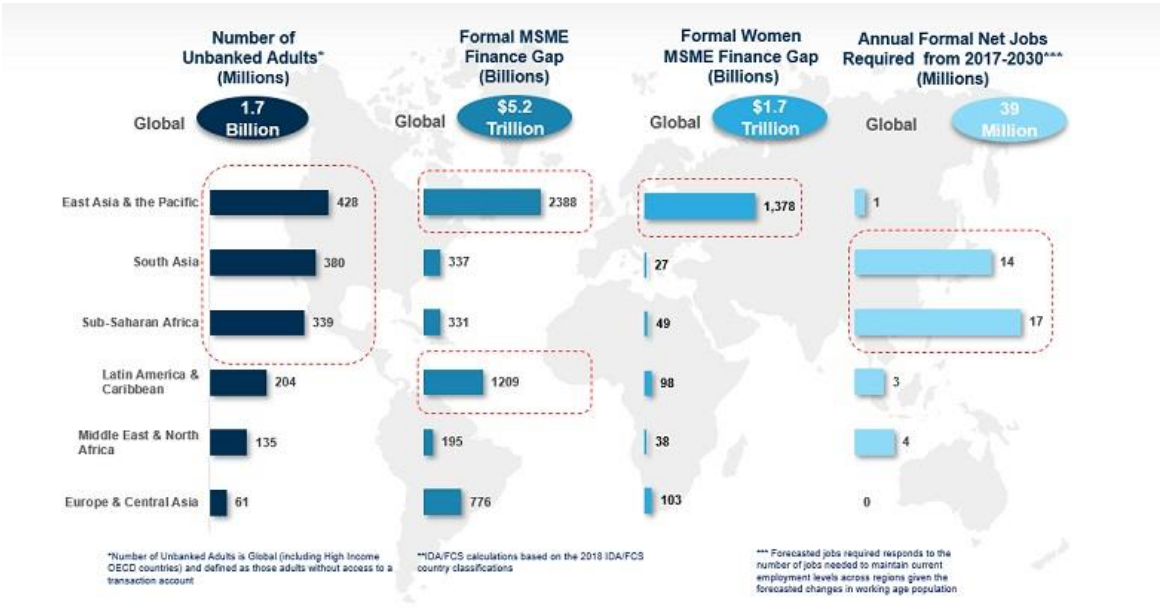


Figure 2. SME financing gap in developing countries

Source: World Bank (2021b)

1.3 MOTIVATION AND NEED FOR THE STUDY

In fact, numerous studies confirm that limited access to finance is perhaps the greatest resource challenge faced by SMEs in Africa (like many developing countries) stifling their economic potential and growth (Aterido and Hallward-Driemeier 2010; Rahaman 2011; Fowowe 2017). For instance, Mazanai and Fatoki (2012) noted that despite concerted efforts over decades, access to finance remains the greatest challenge for SMEs in South Africa limiting their contribution to employment creation, poverty alleviation and economic growth. Fombang and Adjasi (2018) argued that limited finance had detrimental effects on innovation in Cameroon, Kenya, Morocco, Nigeria and South Africa. Furthermore, SMEs in Africa have generally inadequate technology (Maduku 2021), weak technological competencies (Mohlameane and Ruxwana 2013), and a limited capacity to penetrate markets (Hussain 2000; Hashim and Wafa 2002), among many other deficiencies. On the other hand, SMEs have simple business procedures and systems that allow for flexibility, quicker response to customer needs, and feedback than larger firms (Singh et al. 2008). Not surprisingly therefore, there has been no shortage of studies that provide insights on how these unique abilities along with deficiencies shape the operations and competitiveness of SMEs.

Quite intriguing, however, are studies that highlight the impact of the business environment (hereafter BE, and, also referred to as the business climate, investment climate, or entrepreneurial ecosystem) on the behaviour, operations, and performance of SMEs. Broadly speaking, the BE comprises not only the macroeconomic environment, but also the regulatory, legal, institutional, political, security, socio-cultural, infrastructure, and technological setting (Dethier et al. 2011; Belas et al.

2019). The main theme of literature on the BE is that it steers almost all entrepreneurial activities. A good BE impacts positively the performance of firms, creates opportunities for investment, improves innovation output, and creates competition amongst other things (World Bank 2004; Dethier et al. 2011; Trippl 2011; Ehigiamusoe and Samsurijan 2020; Parrilli et al. 2020; World Bank 2020a). Furthermore, SMEs like all firms, are adaptive structures that are shaped in reaction to their external environment (Selznick 1957; Mair and Marti 2009), so, having an enabling BE that is conducive for business operations is often a top priority for many Governments (World Bank 2004, 2020a). For instance, an enabling business licensing and registration environment (which includes easy access to affordable business registration services and entrepreneurial capacity building), would in most cases improve the operations and performance of many firms (Alfaro and Chari 2014; Fernandes et al. 2018).

Despite numerous studies that explore the influence of the general BE on the operations and performance of SMEs in developing countries (Dollar et al. 2005; Escribano and Guasch 2005; Agboli and Ukaegbu 2006; Carlin et al. 2006; Commander and Svejnar 2008; Kinda 2010; Goel 2012; Ipinnaiye et al. 2017; Belas et al. 2019), and in advanced countries (Lee 2014; McCann and Ortega-Argilés 2016; Harju et al. 2019), there is a dearth of literature on how the institutional and regulatory dimensions of the BE impact the operations of SMEs in developing countries and even more so in African countries. For instance, while it is known that good macroeconomic conditions increase the supply of finance (Denizer et al. 2000; Peek et al. 2003; Claessens and Kose 2017), very little is known on whether an enabling institutional and regulatory business environment (hereafter RBE) improves the supply of finance

and impacts the funding choices of SMEs in Africa. For example, it is very likely that a favourable political and tax administration system would improve the performance of financial institutions such as commercial banks in developing countries, giving them greater financial leverage to lend to SMEs which are otherwise considered risky clients (Weill 2008). But would SMEs in an enabling RBE readily access this available funding from commercial banks? Providing answers is essential in understanding the financing behaviour of SMEs in African countries and in informing policies aimed at supporting them.

Second, while it is known that some dimensions of an enabling RBE, such as a good business licensing and registration environment, improves the operations and financial performance of many firms (Alfaro and Chari 2014; Fernandes et al. 2018), would other RBE dimensions (such as trade facilitation) necessarily improve the performance of SMEs? For instance, trade facilitation policies that include lower custom tariffs, encourage export diversification in some developing countries (Beverelli et al. 2015; Osakwe et al. 2018), but resulting competition from foreign firms has a negative toll on the sales and capital accumulation of local firms in other developing countries (Bas and Ledezma 2020). Thus, considering how different components of the RBE and institutions impact the performance of SMEs is important in understanding which regulatory institutions need to be tweaked in addressing some of the many challenges of SMEs in African countries.

Third, despite an extensive pool of literature that examine the finance – performance relationship of firms – see for instance Carpenter and Petersen (2002); Abor (2005);

Beck et al. (2008a); Beck et al.(2008b); Mallick and Yang (2011); Bilgin et al. (2012); Kumar and Rao (2015); and Ayyagari et al.(2017) – there are mixed findings in literature on how different sources of funding impact the financial performance of firms. For instance, Forte and Tavares (2019) documented a negative relationship between long-term debt and the financial performance of manufacturing firms in Europe, while Abor (2007) documented a positive relationship between long-term debt and financial performance, and a negative relationship between short-term debt and financial performance of firms in Ghana and South Africa. Moreover, while Biglin et al.'s (2012) study on 77 developing countries noted that informal sources of finance were detrimental to the performance of firms in developing countries, Priyadharsan (2019) found that informal sources of finance (such as from family and friends and trade credit) positively influence the performance of SMEs in Sri Lanka.

A reason for these mixed findings might be the endogeneity of funding sources, which is often unaccounted for in many studies. For instance, the BE – including institutions and the RBE (as elaborated earlier) – may have a bearing on the funding choices and financial performance of firms (Weill 2008; Alfaro and Chari 2014; Fernandes et al. 2018). Moreover, a firm's previous financial performance has a bearing on its current funding choices (Cassar and Holmes 2003; Abor and Biekpe 2009). For instance, Vanacker and Manigart (2010) found that profitable firms opted for retained earnings over other sources of finance. Likewise, Zoppa and McMahon (2002) suggest that a growth in sales results in additional financial constraints for firms, which is often alleviated with short-term debt. Consequently, would accounting for the endogeneity of funding sources impact the eventual financial performance of firms? Furthermore, since funding sources correlate with each other and sometimes serve as substitutes

(Huang et al. 2011; Casey and O'Toole 2014), would empirical models that also allow for these correlations present more robust findings? It is therefore argued that a coherent theory on the nature of finance and performance of SMEs in African developing countries needs to be presented and that this narrative should account for the endogeneity of funding sources. A concise theory is necessary to inform interventions and policies aimed at supporting SMEs.

Fourth, despite numerous studies that demonstrate the importance of innovation to businesses in all countries such as in giving businesses a competitive edge (Bigliardi 2013; Pomegbe et al. 2020), improving financial performance (Aas and Pedersen 2011) and creating jobs (Ciriaci et al. 2016), very little is known on how the institutional environment of the general BE shape the innovation profiles and output of SMEs in developing countries. For instance, several scholars have in recent years used the existence of innovation systems[3] within the BE to explain differences in the adoption and potency of innovation activities in advanced countries – see, for instance, Isaksen and Karlsen (2010); Trippl, (2011); Isaksen and Nilsson (2013); Nunes and Lopes's (2015); Thoma, (2017); and Parrilli et al. (2020). However, corresponding studies that explore whether specific institutional arrangements in developing countries shape the adoption and effectiveness of innovation activities are sparse but emerging in academic literature – see these recent studies on some African countries: Lukhele and Soumonni (2020), and Medase and Abdul-Basit (2020). For instance,

[3] An innovation system refers to a network of actors - that include, organisations, institutional, social, and cultural elements - that engage in knowledge sharing and technological diffusion to promote innovation. It presumes that intense mutual interactions must be encouraged among actors in a system to turn ideas and information to innovative products or services for the market (Cooke 2001)

while it is well established that regional specificities such as high absorptive and technical capacities[4] define innovation systems in some regions in Europe and impact the adoption and effectiveness of innovation activities – see, Isaksen and Trippl (2017); and Parrilli et al. (2020) – very little is known about the impact of similar specificities on innovation in African countries. Moreover, while it is known that some industries align and exploit effectively certain innovation activities – see, for instance the food industry in Trippl (2011); and Isaksen and Nilsson (2013) – very little scholarly attention has been paid to which innovation activities align with predominant industries in developing countries such as traditional low tech industries in the context of Africa (Wintjes et al. 2014; IMF 2018). Furthermore, while financial constraints (Beck 2007; Fowowe 2017) are prevalent in African developing countries (as discussed earlier), how these constraints influence innovation profiles and output of SMEs in developing countries is unclear.

1.4 AIMS AND OBJECTIVES

Providing answers to the queries raised hitherto on the complicated impact of elements within the BE – such as institutions, the RBE, and innovation systems – on the operations of SMEs is imperative because, (1) SMEs play a significant role as the backbone of growth in African countries (Ayyagari et al. 2007; Naudé 2010; Danuta 2015); yet (2) SMEs tend to be less productive, pay lower wages, and are less likely to

[4] Absorptive capacity refers to a firm's ability to recognize the value of new external information, assimilate it, and apply it to commercial ends such as innovations (Cohen and Levinthal 1990; Carayannis 2012). And, technical capacity refers to the ability to transform formal scientific/ technical knowledge to viable outputs such as innovations (Isaksen and Nilsson 2013).

introduce new products and services than large firms (ILO 2019); and (3) SMEs are not scaled down versions of large firms; SMEs have unique characteristics and so are influenced in much more complex ways by the institutional and overall BE than large firms. Thus, a clearer understanding on how the operations and performance of SMEs are impacted by the institutional and regulatory dimensions of the BE in African countries should provide invaluable insights to improve policies and initiatives aimed at bolstering the operations and performance of SMEs in these countries.

Consequently, this PhD thesis aims to explore how elements within the BE – such as institutions, the RBE, and innovation systems – impact (1) access to finance and funding choices; (2) the financial performance; (3) the funding choices – financial performance relationship, and (4) the innovation profiles and output of SMEs in African countries (see Fig 3 for the conceptual framework of this PhD study).

Figure 3. Conceptual framework

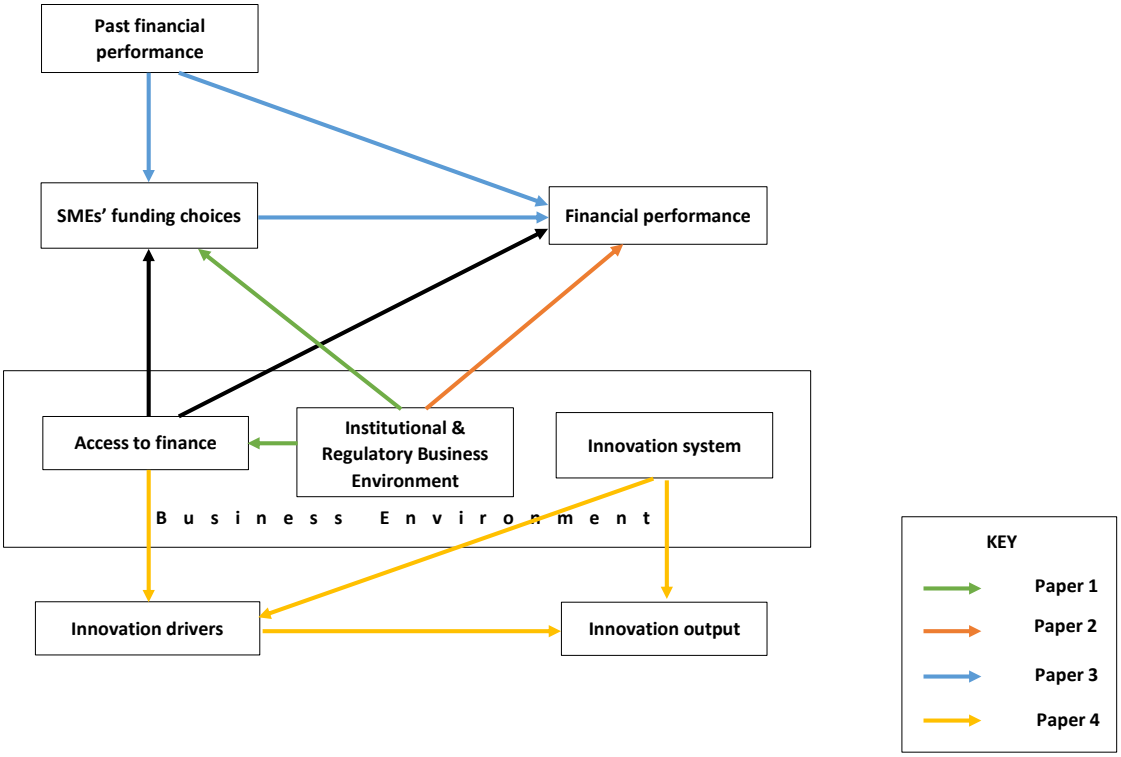


Table 1: Sample description (please see Appendix 1)

1.5 SUMMARY OF RESEARCH METHODOLOGY

The sample employed for this PhD study is derived from the extensive World Bank Enterprise Surveys (WBES). The WBES is a vast data repository that provides firm-level data of over 125,000 firms across 139 countries. The WBES contains over 100 indicators on entrepreneurship (such as sourcing of finance), and the business environment (such as corruption, and the regulatory environment). The majority of firms covered by the WBES are in the manufacturing and service sectors (World Bank 2019b). A sample based on the current available African panel datasets is selected for this study. There are currently 28 African panel datasets available from which 27 were selected[5]. When logged in to the data section ('data by economy') of enterprisesurveys.org, the following search criteria is applied: for survey type – 'enterprise survey' and 'panel data.' Once this is applied, available African panel datasets come up from which panel datasets (i.e., datasets with 2 or more survey years) are selected. For instance, five datasets come up for Morocco with the search above, which are 2004–2007, 2007, 2013, 2013–2019, and 2019. Thus, only the 2004-2007, and 2013-2019 datasets are selected. These datasets are then appended to each other yielding a rich total unbalanced panel sample of 33,205 firms (*n*), and 39,461 observations (*N*) (see Table 1) (World Bank 2020b). Large firms with up to 250 employees are included in this study, so the sample aligns with other studies and the more general definition of SMEs which is up to 250 employees – see for instance the European Commission definition of SMEs (European Commission 2020).

[5] Ethiopia is excluded because its dataset was missing a panel id variable.

This PhD study employs panel regressions, Propensity Score Matching (PSM) methods, and structural equation modelling (SEM) for econometric analysis following similar studies (Baum and Locke 2004; Dollar et al. 2005; Dethier et al. 2011; Fowowe 2017; Quartey et al. 2017; Parrilli et al. 2020).

Traditionally, similar studies have employed regressions to analyse relationships involving the BE of firms, however, standard regressions are prone to multicollinearity, endogeneity issues, and self-selection biases that may confound the estimations (Cavaco et al. 2016; Wooldridge 2016; Ghosh 2017). To counter these problems, PSM and SEM methods are employed. PSM methods are more effective in establishing causal relationships by disentangling the influence of the treatment from other covariates that may well influence the outcome construct (Phillipson et al. 2019). PSM methods also allow for the reduction of selection bias which may have occurred in the data collection process (Cepeda et al. 2003). Moreover, SEM is a technique that combines factor analysis, path analysis, and multiple regression analysis amongst others, to determine the relationship between observed and unobserved variables (Kaplan 2001; Wooldridge 2010). Thus, following similar studies, PSM and SEM methods are deemed to be appropriate empirical methods to test the substantive objectives of this PhD study (Baum and Locke 2004; Dollar et al. 2005; Dethier et al. 2011; Yazdanfar and Öhman 2015a; Fowowe 2017; Quartey et al. 2017; Parrilli et al. 2020).

1.6 KEY FINDINGS

The key findings of this PhD thesis are as follows:

1. Access to (or the supply of) external finance increases in African countries with enabling institutional and RBEs, however, access to finance does not translate to increased patronage by SMEs. This is because external forms of finance in African countries remain relatively expensive even though available, thus, typically SMEs opt for retained earnings over any form of external finance (such as funding from banking and non-banking institutions and trade credit).

2. Not all dimensions of an enabling institutional and RBE enhance the financial performance of SMEs in African countries. While an enabling business licensing and tax administration environment improves the performance of SMEs, an enabling trade facilitation environment impedes the performance of SMEs in African countries. This finding is very interesting and seems to be borne from the argument that SMEs cannot compete with foreign firms when trade across borders is liberalized in African developing countries. In such instances, trade facilitation acts against its intended purpose of improving the performance of firms (Hunt et al. 2007; Terzİ 2010; Siddiqui 2015).

3. Working capital funding from internal sources (such as owners, family, and friends, and retained earnings) results in weaker financial performance for SMEs in African countries. This finding confirm that SMEs in developing countries (or Africa in this study) are generally financially constrained (Abor et al. 2014; Fowowe 2017) and so rely on internal sources (such as from

owners, family and friends) to fund their operations (Mallick and Yang 2011; Zabri et al. 2015; Akinkoye and Akinadewo 2018). This funding behaviour, however, leads to poor financial gains since internal funds are likely to be inadequate leaving such firms still financially constrained.

4. Working capital funding from financial institutions (banking and non-banking) results in stronger financial performance for SMEs in African countries. This finding underscores the line of thought that any access to badly needed external finance should improve the financial performance of SMEs in developing countries (Beck and Demirguc-Kunt 2006; Beck 2007; Kersten et al. 2017).

5. Working capital funding from trade credit results in weaker financial performance for SMEs in African countries. This is so because, there are limitations to the application of trade credit especially to the operations of firms. Trade credit itself may not fully relieve the financial constraints faced by SMEs needing cash for their operations since it cannot be diverted to other investments (Burkart and Ellingsen 2004). Moreover, the use of trade credit doesn't come cheap, there are eventual costs that financially constrained firms will need to bear (Cheng and Pike 2003) which often lead to weaker financial performance.

6. Many SMEs in Africa are associated with DUI innovation drivers which stems from the dominance of traditional low to medium tech industries, and weak technological and absorptive capacities in Africa. This is an interesting finding that contrasts very much with the innovation adoption profiles in advanced

countries (where there is a relatively lower adoption of DUI drivers and a higher adoption of STI drivers) and indicates that there is still more to be done to improve the profile of industries (IMF 2018) and to foster firm innovation in Africa (World Bank 2017).

7. SMEs that utilise STI drivers alone or in combination with DUI drivers generate higher innovation outputs in general than SMEs utilising DUI drivers alone. This finding aligns with similar studies in advanced countries but novel to the context of Africa (Jensen et al. 2007; Chen et al. 2011; Isaksen and Nilsson 2013; Parrilli and Heras 2016). It demonstrates the effectiveness of scientific and technical activities in driving a variety of innovations (Rammer et al. 2009; Trippl 2011; Parrilli and Elola 2012), yet very few firms in Africa adopt scientific and technical innovation activities.

8. SMEs that adopt a combination of STI and DUI drivers generate greater business process (or non-technological) innovations than those that rely solely on DUI drivers. This finding is unique and context specific, indicating that despite SMEs generating modest business process innovations from mainly DUI activities in Africa, the addition of STI activities provides a boost to the generation of business process innovations because scientific, and technical knowledge has a more direct application to innovations (Rammer et al. 2009; Fitjar and Rodríguez-Pose 2013).

9. Financial constraints have a greater effect on the generation of product (technological) innovations than on business process (non-technological)

innovations for SMEs in Africa. This is may be because STI drivers which are mainly associated with product innovations (Jensen et al. 2007; Parrilli and Heras 2016) are more prone to the effects of financial constraints (Brown et al. 2012).

1.7 CONTRIBUTIONS OF THE RESEARCH

This PhD study contributes to literature in these ways.

Theoretically,

1. This study departs from most studies that proxy the BE with macroeconomic indicators - see, for example, Bhattacharjee et al. (2009), and Rusu and Roman (2016) - but aligns with scholarly works that note the importance of the institutional setting in shaping the quality of the BE where firms operate (Belas et al. 2019; Cojocaru and Susanu 2019; Forte and Tavares 2019).

2. This is the first study to consider the influence of the institutional and regulatory elements of the BE on funding choices and the financial performance of SMEs in African developing countries, unlike most studies that focus on the influence of firm-related factors (Beck and Demirguc-Kunt 2006; Abor and Biekpe 2009; Yuko et al. 2015; Rostamkalaei and Freel 2016; Coetzee and Buys 2017; Cowling et al. 2018), and entrepreneur-related factors (Irwin and Scott 2010; Makler et al. 2013; Vasilescu 2014; Li 2015; Yuko et al. 2015; Pallegedara 2017).

3. This study extends the theory of financing and its impact on the financial performance of SMEs in developing countries. It provides a clearer picture of the interrelationship between SME financing from a variety of sources, financial performance, and the endogeneity of funding sources in developing countries.

4. It adds to the literature of how specific institutional arrangements in African countries shape the adoption and effectiveness of innovation activities and contributes to debates on which innovation drivers are most effective for specific countries or regions. It also provides a better understanding of which innovation drivers policy makers could enhance to foster innovation output and growth in African countries.

5. This PhD study also provides invaluable insights to policy makers, Governments, regulatory bodies, and owners/ managers of SMEs on which institutional and regulatory elements of the BE could be targeted in policies aimed at increasing productivity, innovation, and the financial performance of SMEs in African countries.

Empirically,

1. This PhD study contributes to the literature on the reliability of subjective proxies of the BE by demonstrating that objective and subjective proxies of the RBE have similar effects on the operations of SMEs.

2. It goes beyond similar BE studies that rely on standard regressions (which are prone to issues of endogeneity and self-selection bias) by employing PSM and SEM methods (Dethier et al. 2011).

3. This PhD study also demonstrates the complexity associated with assessing the finance -performance relationship of firms and the need to employ methodical approaches that account for a wider range of relationships to be assessed simultaneously.

1.8 STRUCTURE OF THE THESIS

This PhD thesis follows the integrated thesis format (also known as three papers PhD model) and is structured as follows:

Following this introductory chapter, the second chapter presents a concise overview of the business and institutional environment in developing countries. The third to

sixth chapters present four unpublished papers[6] that address the objectives of this thesis which is to explore how elements within the BE – such as institutions, the RBE, and innovation systems – impact (1) access to finance and funding choices; (2) the financial performance; (3) the funding choices – financial performance relationship, and (4) the innovation profiles and output of SMEs in African countries (see Fig 3).

The first paper (in chapter three) is entitled, 'The impact of the regulatory business environment on access to finance and funding choices of SMEs in developing countries - evidence from Africa.' This paper addresses the first objective of this thesis.

The second paper (in chapter four) is entitled, 'The impact of the regulatory business environment on the performance of SMEs in developing countries - new evidence from Africa.' This paper addresses the second objective of this thesis.

The third paper (in chapter five) is entitled, 'The finance – performance nexus of SMEs in African countries: What really matters?' This paper addresses the third objective of this thesis.

[6] The first two papers are currently under consideration in CABS 3-star journals for possible publication

Finally, the fourth paper (in chapter six) is entitled 'Business innovation modes of SMEs in developing countries – new evidence from Africa.' This paper also addresses the fourth and final objective of this thesis.

The last chapter (seven) presents the conclusions and policy implications of findings in this PhD thesis.

CHAPTER TWO – THE BUSINESS ENVIRONMENT IN DEVELOPING COUNTRIES

2.1 CHAPTER OVERVIEW

This chapter considers the business context for SMEs in developing countries and Africa. It also introduces the institutional theory which drives this PhD study.

2.2 INSTITUTIONAL THEORY AND INSTITUTIONAL VOIDS

Even though for decades scholars have explored how economic activities are influenced by institutions within a country, it was not until the 1950s that institutional theory was first introduced. One of such theorists, Selznick (1957), suggested that the organisational structure was an adaptive vehicle that was shaped in reaction to the effects of participants as well as the external environment. In other words, firms are impacted by their internal and external environments.

In the 1990s, the theory of how institutions and institutional change impact economic activity was expanded by North (1990), and the World Bank introduced the novel aggregate (governance) indicators for measuring institutional quality in countries (Kaufmann et al. 1999). Additionally, Khanna and Palepu (1997) introduced and defined ‘institutional voids’ as the absence or underdevelopment of institutions that enable and support market activity. This network of systems or institutions includes political, financial, legal, and regulatory systems that provide an enabling environment for entrepreneurship (Mair and Marti 2009; Saul et al. 2013). For instance, some studies emphasise how business regulations, which should be provided by

governments, influence enterprises and how firms react to the absence of these regulations (Mair and Marti 2009; Puffer et al. 2010; Stal and Cuervo-Cazurra 2011). Other studies underscore how infrastructure or the prevalence of corruption bears on the operations of firms and the flow of investment (Agboli and Ukaegbu 2006; Ihua 2009; Kinda 2010). Yet still other studies focus on political institutions and their effect on entrepreneurial activity (Luiz and Ruplal 2013; Goel et al. 2017; Williams 2018).

Furthermore, three dimensions of the institutional context was proposed by Scott (1995). They are the regulatory, normative, and cognitive dimensions. The regulatory dimension refers to governmental and legal institutions that enforce rules of conduct on firms. Non-compliance to these regulations often lead to punitive measures. For instance, non-compliance to taxation may lead to fines or even prosecution. Normative dimensions refer to rules of thumb, standard operating procedures, or occupational standards. Firms adhere to this institutional dimension due to social obligation or professionalism (Chu 2009; Chao and Kumar 2010). Hence, a firm may choose to adopt a corporate social responsibility (CSR) intervention not because they are required to do so but due to social responsibility. Cognitive dimensions refer to cultural rules, beliefs and practices that firms abide by without necessarily any conscious thought (Mair et al. 2007; Chao and Kumar 2010). For instance, firms that operate in cultures where high priority is placed on age and respect for the elderly, would unwittingly prefer older individuals to assume management roles even when such individuals may be unsuitable for those roles. Interestingly, scholarly work shows that countries vary in the nature and influence of these three dimensions in their markets (Doh et al. 2017). Whilst the regulatory dimension may seem to be dominant and more visible in many countries, the normative and cognitive dimensions are in no way less

important in shaping the strategic choices of firms and their performance (Kshetri 2010).

Furthermore, scholarly literature points to formal and informal institutions that have systemic effects on the behaviour of firms and individuals within them (North 1990; Mair et al. 2007; Stal and Cuervo-Cazurra 2011). Formal institutions encompass regulatory and legal institutions discussed earlier. Whereas informal institutions cover normative and cognitive institutions. While some studies have focused on the importance and influence of formal institutional voids on enterprises, fewer studies have explored informal institutional voids in the context of developing countries.

2.3 INSTITUTIONAL VOIDS IN DEVELOPING COUNTRIES

Developing countries struggle with the provision of formal institutions to support their markets (Beck et al. 2008b). In situations where there are some institutional arrangements, they are often ineffective or weak (Xiaowei and Chi-Nien 2013). Institutional voids in developing countries hinder the performance of SMEs which are already frail and weak compared to larger firms. For instance, the absence of institutions bears heavily on the ability of SMEs to formalize and obtain adequate legal status in African countries (Murithi et al. 2020). This is so because many SMEs in African countries are often set up as a response to poverty and unemployment, taking advantage and absorbing much of the informal and unemployed workforce (Sparks and Barnett 2010; Nguimkeu 2014), thus, there is little incentive other than

institutional intervention to pursue formality. Many informal firms in African countries also do not seek to be formalised because they have little desire to grow or to access formal sources of finance or simply because they would prefer to be 'unknown' to avoid paying taxes (Abrie and Doussy 2006).

For SMEs in African countries to formalise without the aid of institutions and incentives would also be costly and would likely drain their current resources which need to be managed expediently. Hence, many informal SMEs would more likely prefer to remain informal until they have sufficient financial muscle such as higher turnover or human resource to pursue formality (Prado 2011). Then they can have easier access to formal credit from financial institutions or formal markets, access better equipment, increase their scale of operation, and operate in a more competitive environment.

Without doubt, the presence of institutions and government policy that reduce the cost of obtaining legal registration significantly reduces the proportion of informal firms and improves overall labour market performance (Fajnzylber et al. 2011; Prado 2011; D′Erasmo et al. 2014; Boly 2018). Hence, African countries with weak institutions have a high prevalence of informal unregistered firms (Henley et al. 2009; Harati and Shamruk 2013; ILO 2018).

Following is a consideration of some key elements of regulatory and financial institutions in developing countries but with emphasis on African countries.

2.4 REGULATORY AND INSTITUTIONAL ENVIRONMENT IN DEVELOPING COUNTRIES

The extensive World Bank's Doing Business report identifies 12 key dimensions that shape the institutional and RBE of firms. These 12 dimensions range from the ease of starting a business to the enforcement of contracts and resolving insolvency (World Bank 2020a). Table 2 presents these 12 regulatory dimensions.

Table 2: Dimensions of the institutional and regulatory business environment

	Indicator set	What is measured
1	Starting a business	Procedures, time, cost, and paid-in minimum capital to start a limited liability company for men and women
2	Dealing with construction permits	Procedures, time, and cost to complete all formalities to build a warehouse and the quality control and safety mechanisms in the construction permitting system
3	Getting electricity	Procedures, time, and cost to get connected to the electrical grid; the reliability of the electricity supply; and the transparency of tariffs
4	Registering property	Procedures, time, and cost to transfer a property and the quality of the land administration system for men and women
5	Getting credit	Movable collateral laws and credit information systems
6	Protecting minority investors	Minority shareholders' rights in related-party transactions and in corporate governance
7	Paying taxes	Payments, time, and total tax and contribution rate for a firm to comply with all tax regulations as well as post-filing processes
8	Trading across borders	Time and cost to export the product of comparative advantage and to import auto parts
9	Enforcing contracts	Time and cost to resolve a commercial dispute and the quality of judicial processes for men and women
10	Resolving insolvency	Time, cost, outcome, and recovery rate for a commercial insolvency and the strength of the legal framework for insolvency
11	Employing workers	Flexibility in employment regulation
12	Contracting with the government	Procedures and time to participate in and win a works contract through public procurement and the public procurement regulatory framework

Source: World Bank (2020a)

At the heart of the Doing Business report is freedom to do business; or in other words regulation that allows businesses to start and operate their businesses freely. Sadly, many governments implement regulations that inadvertently burden business limiting their productivity and growth (World Bank 2020a). Out of the 12 dimensions of the regulatory environment (noted in the Doing Business report) that impact firms, this thesis focuses on three main dimensions that have a profound impact on SMEs in African countries – which are, tax administration, business licensing and permit regulations, and customs and trade regulations. For instance, extant literature contends that African countries have poor tax regulation and administration systems leading to significant noncompliance to taxation (Adegboye et al. 2018). Businesses in Nigeria and South Africa view tax regulation and administration as a burden to their businesses, stifling productivity to the extent that tax compliance requirements are viewed as a stumbling block for enterprises (Abrie and Doussy 2006; Adegboye et al. 2018). Adeniyi and Imade (2018) posited that there is a significant relationship between multiple tax burdens and the performance of businesses in Nigeria, often as a result poor tax administration. To compound the problems associated with poor tax regulation, unregistered SMEs in some developing countries are able to evade the relatively high tax burden that registered SMEs have to bear (Muent et al. 2001). Ironically, this compels registered SMEs in Zimbabwe to also evade compliance by paying bribes, falsifying records, moving premises or by engaging in other fraudulent activities (Nyamwanza et al. 2014; Giang et al. 2016).

Waseem (2018) noted that many firms in Pakistan reported significant lower earnings when a new detrimental tax reform was introduced. Many of these firms moved some of their operations to the informal economy or even changed their legal form. Evidently, these tax reforms had a negative impact on the performance of Pakistani firms. Conversely, favourable tax administration boosts the performance of firms in developing countries. For instance, Rocha et al. (2018) noted that reducing tax rates increased formality and the general performance of firms in Brazil.

Another element of the institutional and RBE which is of interest in African countries relates to business licensing and permits. Even though literature in this area is scanty for Africa, the regulatory aspects of licensing for businesses is generally accepted as being ineffective and weak in developing countries including Africa (Devas and Kelly 2001). Poor regulation and oversight of business licensing often leads to high numbers of unlicensed businesses and at worse business failures even in developed countries (Friedberg et al. 2004). Enterprises in developing countries report that restrictions on access to appropriate licensing and permits force them to engage in corrupt practices (Goel 2012; Anderson 2019). These practices often involve collusion between government officials and entrepreneurs to obtain licenses and permits fraudulently leading to high monetary and non-monetary effects on businesses, with the latter being more pronounced (Goel 2012; Giang et al. 2016). On the other hand, Fernandes et al. (2018) found a remarkable improvement in productivity of firms after easier business licensing reforms were introduced in Portugal. Similarly, Alfaro and Chari (2014) noted that there were more start-ups in industries with easier start up regulations than industries with cumbersome regulations in India. There was also a 20% (average)

increase in the value of firms in Vietnam when favourable start up reform was implement (Demenet et al. 2016).

The strength of customs and trade regulations also has a bearing on the performance of enterprises. There is little doubt that adequate customs and trade regulations also improve the performance of firms in developing countries (Elmane-Helmane and Ketners 2012). In fact, inadequate customs and trade facilitation framework is seen as a major hindrance for firms in Sub Saharan African countries to connect with the global value chains (Shepherd 2016). Martincus et al. (2015) found a 4% decrease in exports when there was a 10% increase in custom delays for exporting firms in Uruguay, and Francois and Manchin (2013) noted that low institutional and infrastructure quality, limits market access for exporting firms in developing countries. Conversely, Portugal-Perez and Wilson (2012) found that the performance of firms in many developing countries increased when infrastructure and information and communications technology (ICT) for exports were introduced. Trade liberalisation policies that include the lower custom tariffs, also encourage export diversification (Beverelli et al. 2015; Osakwe et al. 2018).

2.5 FINANCIAL INSTITUTIONAL ARRANGEMENTS IN DEVELOPING COUNTRIES

Extant literature indicates that financial systems in developing countries are mainly centralised and weaker when compared with advanced countries (Beck 2007). These financial systems are often dominated by banks as in advanced countries but tend to be less exposed to SMEs, provide a lower share of investment loans, and charge higher fees and interest rates (Beck et al. 2008b; Quaye 2014). This often creates real obstacles in accessing finance for many enterprises in developing countries (Yuko et al. 2015; Fowowe 2017; Quartey et al. 2017).

It is also believed that low bank concentration in developing countries increases obstacles SMEs face to obtaining finance in countries with low level of economic and institutional development (Beck et al. 2004). Microeconomic instability and enterprises' lack of awareness/ information on possible sources of finance are also identified as obstacles to accessing finance (Iraj 2001; Abor and Biekpe 2006; Asare 2017). Financial institutions also have varying requirements for accessing finance, thereby creating an added obstacle in accessing finance from them (Domeher 2012; Coetzee and Buys 2017). Hence, SMEs are generally denied access to finance by commercial Banks and big financial institutions in developing countries (Beck 2007).

Even though the financial systems in developing countries are dominated by banks, there have been moves towards the introduction of microfinance institutions (MFIs) in recent years. The operations of MFIs are having positive impact on SMEs helping bridge the financing gap by adopting innovative ways to counteract obstacles faced by SMEs in accessing finance from commercial banks in Ghana (Quaye 2014).

Conversely, it is generally agreed that there adequate and efficient institutional arrangements in advanced countries to support entrepreneurial activity. Financial systems in advanced countries are stronger than developing countries and are either centralised (e.g., UK) or decentralised (e.g., Germany) with robust institutions to support markets. However, centralised financial systems in advanced countries tend to have more challenges than decentralised systems (Britta and Ron 2005; Beck 2007). Banks dominate the financial markets in advanced countries often leading to competition. Many banks are also very much exposed to SMEs leading to the provision of tailored packages to support them (Beck et al. 2008b; Beck et al. 2013). Furthermore, the demand characteristics of SMEs tend to affect the supply packing from financial institutions (Hamilton and Fox 1998). Ironically, the increased market power of Banks in advanced countries results in increased financing constraints for SMEs and increases in financial systems that are more bank dependent (e.g. centralized financial systems) (Ryan et al. 2014). There are also universal requirements for accessing finance from financial institutions in advanced countries (e.g., New Basel Capital Accord on bank capital requirements for SMEs) (Altman and Sabato 2005; Berger 2006). On access to finance, firms in deprived areas are more likely to perceive access to finance is a problem. However, there is no evidence that they actually do find it harder to obtain finance (Lee and Drever 2014). There is no evidence that smaller institutions are also better in providing access to finance in advanced countries even though recommended for low income economies (Beck et al. 2013).

2.6 ACCESS TO FINANCE FOR INFORMAL FIRMS IN AFRICA

The informal sector contributes enormously to the economic fabric in developing countries, creating employment, and reducing the prevalence of poverty. It is estimated that the informal sector stands at 40-50% of GDP in developing countries (Schneider et al. 2010) and about 55-80% of GDP in African countries making it an enormous driver of economic growth in African countries (Abdelkader and Mansouri 2013; Moyo and Sibindi 2020). Nevertheless, the informal sector along with informal firms are considered to be in a shadow economy which is largely unaccounted for by governments (Amin and Islam 2015) and generally neglected in the financial sector (Turkson et al. 2020). This is because the majority of SMEs in Africa are unbanked and patronise informal sources of funding, moreover, fewer than 25% of adults in Africa patronise the services of formal financial institutions (Demirgüç-Kunt and Klapper 2012). Farazi (2014) argued that the vast majority of informal firms in Africa remain informal so as to avoid paying taxes and fund their operations and investments with informal sources of funding such as internal funds, money lender, family, and friends.

In a study based on six African countries (Kenya, Uganda, Tanzania, Zambia, South Africa, and Senegal) Ingram et al. (2007) noted that firm decision to pursue formality is positively influenced by a conducive business environment, which includes access to electricity, finance, and land. Relatedly, Gajigo and Hallward-Driemeier (2012) noted that poor productivity and corruption drove registered firms back to informality

in Cote d'Ivoire, Kenya, Nigeria and Senegal. Nevertheless, access to finance (in the form of bank finance) and productivity increase the likelihood of informal firms switching to formality (Gajigo and Hallward-Driemeier 2012), and high-growth SMEs in Africa are less likely to access formal sources of funding compared with other developing countries (Demirgüç-Kunt and Klapper 2012)

Given that informal firms are generally overlooked by financial institutions, informal firms turn to informal sources of funding such as personal savings, family borrowing and trade credit (Beck et al. 2008a; Gudov 2013; Allen et al. 2019). In a recent study, Turkson et al. (2020) examined the impact of different sources of funding on the growth of informal firms in Ghana and found that formal sources of funding had greater impact on the growth of informal firms that informal sources of funding (Turkson et al. 2020). Even though financial institutions shy away from lending to informal firms, Moyo and Sibindi (2020) noted that bank competition in African countries increases access to formal finance for informal firms. However, registered formal firms that face market competition from informal firms are more likely to be credit constrained than firms that do not face competition from informal firms (Distinguin et al. 2016). Additionally, registered micro and small firms are more prone to competition and subsequent credit constraints from informal firms that medium-sized firms (Distinguin et al. 2016). In a study that investigated whether larger informal firms are more productive than smaller informal firms, Amin and Islam (2015) noted that small informal firms were more productive than large informal firms, thus, increasing the size of informal firms may not necessarily be beneficial. (Amin and Islam 2015)

CHAPTER THREE - THE IMPACT OF THE REGULATORY BUSINESS ENVIRONMENT ON ACCESS TO FINANCE AND FUNDING CHOICES OF SMES IN DEVELOPING COUNTRIES - EVIDENCE FROM AFRICA

3.1 CHAPTER OVERVIEW

This chapter presents the first of four papers that address the objectives of this PhD study. It explores how elements within the BE – institutions and the RBE – impact access to finance and funding choices of SMEs in African countries.

THE IMPACT OF THE REGULATORY BUSINESS ENVIRONMENT ON ACCESS TO FINANCE AND FUNDING CHOICES OF SMES IN DEVELOPING COUNTRIES - EVIDENCE FROM AFRICA

ABSTRACT

Access to affordable finance remains a major challenge for many small and medium-sized enterprises (SMEs) in developing countries despite their immense contribution to the economies of these countries. While it is known that some elements of the business environment (BE), such as macroeconomic conditions, impact access to finance and the funding choices of SMEs, very little is known if other elements of the BE – such as the institutional and regulatory business environment (RBE) – influence access to (or supply of) finance and the funding choices of SMEs. Using a World Bank Enterprise Surveys (WBES) panel sample of 39,461 firm observations from 27 African countries and employing Propensity Score Matching (PSM) methods, it is noted that while an enabling institutional and RBE in Africa increases access to external finance for SMEs, SMEs still opt for retained earnings over external finance specially to fund their working capital. This funding behaviour can be explained by that SMEs located in enabling RBEs have increased productivity and financial performance and so can employ larger amounts of retained earnings for their operations. Furthermore, even though more accessible in enabling RBEs, external finance remains unaffordable for SMEs in Africa. These findings indicate the need to tailor interventions to make varied finance more accessible and affordable for SMEs in developing countries.

Key words: SME finance, access to finance, developing countries, Africa, business environment, regulatory institutions

1. INTRODUCTION

There is little doubt that small and medium-sized enterprises (SMEs) contribute immensely to the economies of developing countries (Ayyagari et al. 2007; Danuta 2015). They often serve as the backbone of growth in these regions, accounting for about 70% of GDP and 75% of general employment (Beck et al. 2005a). These facts show the potential of SMEs to fortify economic progress in developing countries. For instance, Ayyagari et al.'s (2014) study based on 104 developing countries noted that SMEs have the largest proportion of job creation and the highest sales and employment growth in developing countries. This capacity is widely confirmed (Li et al. 2012; World Bank 2016; Ayyagari et al. 2017; Kersten et al. 2017).

Nevertheless, access to finance is still a major challenge for many SMEs in developing African countries despite numerous interventions (Abor et al. 2014; Wang 2016; Coetzee and Buys 2017). For instance, decades of efforts in South Africa have yielded limited results in making finance more accessible for SMEs (Mazanai and Fatoki 2012). Moreover, Fombang and Adjasi (2018) argued that limited finance had detrimental effects on innovation in Cameroon, Kenya, Morocco, Nigeria and South Africa. While there is a pool of literature on why this challenge still persists (Beck et al. 2008a; Xiang and Worthington 2015; Moritz et al. 2016; Ayyagari et al. 2017; Quartey et al. 2017), few studies, if any, have explored how the unique institutional and regulatory business environment (hereafter RBE) influence access to finance and

the funding choices of SMEs in African countries[7]. While it is known that good macroeconomic conditions increase the supply and access to finance for SMEs (Denizer et al. 2000; Peek et al. 2003; Claessens and Kose 2017), very little is known on whether an enabling institutional and RBE has a similar effect. For instance, a favourable political and tax administration system should improve the performance of financial institutions such as commercial banks in African countries, giving them greater financial leverage to lend to SMEs which are otherwise considered risky clients (Weill 2008). But would SMEs in an enabling RBE readily patronize this available funding from commercial banks? Providing answers is essential in understanding the financing behaviour of SMEs in African countries and in informing policies aimed at supporting them.

Furthermore, SMEs are not scaled-down versions of large firms, SMEs have unique characteristics and so are influenced in much more complex ways by the RBE (and overall BE) than large firms. For instance, whilst large firms may not be heavily impacted by poor business regulations such as obstructive tax administration, many SMEs would view such regulations as a burden and a major stumbling block to their operations (Abrie and Doussy 2006; Adegboye et al. 2018). Thus, a clearer understanding on how the RBE in African countries impacts access to finance and the funding choices of SMEs should provide invaluable insights to improve policies and

[7] A favourable overall business environment (BE) (which includes the regulatory setting and the economic, political, socio-cultural, and institutional setting) impacts almost all entrepreneurial activities. It impacts the performance of firms positively, creates opportunities for investment, and creates competition, amongst other things (World Bank 2004; Dethier et al. 2011; Ehigiamusoe and Samsurijan 2020; World Bank 2020a).

initiatives aimed at bolstering access to finance and performance of SMEs in these countries.

Using a rich panel sample of 39,461 firm observations (covering 27 African countries) from the World Bank Enterprise Surveys (WBES) conducted between 2003 and 2019, it is found that while an enabling institutional and RBE in Africa increases the supply of external finance to SMEs, SMEs still opt for retained earnings over external finance. It is argued that this funding behaviour is so because, first, SMEs located in enabling RBEs have increased performance and so are able to employ larger amounts of retained earnings for their operations. And second, external finance, even though more accessible in an enabling RBE, remains unaffordable for SMEs in Africa.

This paper contributes to the literature in the following ways. First, this is the first study to consider the influence of the RBE on access to finance and the funding choices of SMEs in developing countries unlike most studies that focus on the influence of firm-related factors (Beck and Demirguc-Kunt 2006; Abor and Biekpe 2009; Yuko et al. 2015; Rostamkalaei and Freel 2016; Coetzee and Buys 2017; Cowling et al. 2018), and entrepreneur-related factors (Irwin and Scott 2010; Makler et al. 2013; Vasilescu 2014; Li 2015; Yuko et al. 2015; Pallegedara 2017).

Second, this paper departs from most studies that proxy the business environment (BE) with macroeconomic indicators - see, for example, Bhattacharjee et al. (2009) and Rusu and Roman (2016) - but align with emerging scholarly works that note the

importance of the institutional setting in shaping the quality of the BE where firms operate (Belas et al. 2019; Cojocaru and Susanu 2019; Forte and Tavares 2019). It also demonstrates that the institutional and RBE might be more reliable measures of the BE's impact on the operations of firms than other traditional measures such as macroeconomic indicators.

Third, by proxying the RBE with both objective and subjective regulatory, institutional measures, this study contributes to a clearer understanding of how regulatory institutions contribute to the overall BE. Furthermore, this study demonstrates that indeed subjective measures of the BE are complimentary to objective measures and that these do not just reflect firm experiences but are reliable measures of the BE.

The rest of this paper is structured as follows: section 2 presents the theoretical arguments and hypotheses; section 3 outlines the data and empirical approach adopted for the study; section 4 presents the results and discussion; and section 5 concludes the study.

2. THE UNIQUE INSTITUTIONAL AND REGULATORY BUSINESS ENVIRONMENT (RBE) IN DEVELOPING COUNTRIES

Even though scholars have explored how institutions influence economic activity within a country for decades, it was not until the 1950s that 'institutional theory' was

first introduced. Selznick (1957), suggested that the organisational structure was an adaptive vehicle that was shaped in reaction to the effects of participants as well as the external environment. Since then, there have been numerous definitions and approaches to the theory with substantial variations (Scott 1987). For instance, in the 1990s, the theory of how institutions and institutional change impact economic activity was expanded by North (1990), and the World Bank introduced novel aggregate (governance) indicators for measuring institutional quality in countries (Kaufmann et al. 1999). Additionally, Khanna and Palepu (1997) introduced and defined 'institutional voids' as the absence or underdevelopment of institutions that enable and support market activity. This network of systems or institutions includes political, financial, legal, and regulatory systems that provide an enabling environment for entrepreneurship (Saul et al. 2013). The absence of these institutions is termed an institutional void (Mair and Marti 2009)[8].

African countries like many developing countries struggle with the provision of adequate institutions (Beck et al. 2008b). In instances where these institutional arrangements are present, they are often weak or ineffective (Xiaowei and Chi-Nien 2013). Extant literature often points to the prevalence of poor regulatory institutions in developing countries which should otherwise provide policy and regulation of markets for businesses (Smallbone et al. 2001; Agarwal and Mohtadi 2004; Kaivanto and Stoneman 2007; Beck et al. 2008a). For instance, many African countries have poor tax regulation and administration systems (Adegboye et al. 2018). Thus, many

[8] See Chapter Two for a further discussion of the institutional environment in developing countries

businesses in African countries view obstructive tax regulation and administration as a burden to their businesses, stifling productivity to the extent that tax compliance requirements are viewed as a stumbling block (Abrie and Doussy 2006; Adegboye et al. 2018). Waseem (2018) noted that many firms in Pakistan reported significantly lower earnings when new detrimental tax reform was introduced. Some of these firms moved their operations to the informal economy or even changed their legal form. Evidently, these tax reforms had a negative impact on the performance of Pakistani firms. Conversely, favourable tax administration boosts the operations of firms in developing countries. For instance, Rocha et al. (2018) noted that reducing tax rates increased formality and the general performance of firms in Brazil.

As with tax administration and compliance, the regulatory aspects of licensing for businesses is ineffective and weak in African countries (Devas and Kelly 2001). This poor regulation and oversight of business licensing often lead to high numbers of unlicensed businesses and at worse, business failures (Friedberg et al. 2004). Many firms in developing countries report that restrictions on access to appropriate licensing and permits force them to engage in corrupt practices (Goel 2012; Anderson 2019). These practices often involve collusion between Government officials and entrepreneurs to obtain licenses and permits fraudulently, leading to high monetary and non-monetary effects on businesses (Goel 2012; Giang et al. 2016).

Moreover, financial systems in African countries are also weak and, to a large extent, inefficient. This often creates real obstacles in accessing finance for many firms in developing countries (Yuko et al. 2015; Fowowe 2017; Quartey et al. 2017).

Furthermore, financial systems in Africa (and developing countries generally) are dominated by banks that tend to be less exposed to SMEs, provide a lower share of investment loans, and charge higher fees and interest rates (Beck et al. 2008b; Quaye 2014). Financial institutions also have varying requirements for accessing finance, thereby creating an added obstacle in accessing finance from them (Domeher 2012; Coetzee and Buys 2017). Hence, SMEs are generally denied access to finance by commercial banks and big financial institutions in developing countries (Beck 2007).

Therefore, as a consequence of weak financial systems, retained earnings remain the most popular funding source for SMEs in developing countries (Zabri et al. 2015). Many SMEs prefer funding from retained earnings over external finance in the first instance for investment, expansion, and growth[9] (Bassetto et al. 2015; Mishra and Cooper 2017; Nguyen 2020). Furthermore, given that firms in locations with favourable RBEs (as elaborated hitherto) have better productivity and financial performance, it stands to reason that they will rely more on retained earnings for investment in their operations since they are more likely to make profits and allocate these as retained earnings. Moreover, retained earnings will still be cheaper compared to any form of external finance available to SMEs in African countries. Paulo (2018) noted that the amount of retained earnings employed by firms seems to be influenced by their country's economic environment; thus, a favourable RBE (which is associated with a country's economic development) promotes an increase in retained earnings.

[9] The use of retained earnings (internal funds over external funds) may be demand driven and explained by pecking order and /or trade off behaviour (Myers and Majluf 1984; Hussain et al. 2006; Bassetto et al. 2015; Mishra and Cooper 2017). However, these choices could also be influenced by the institutional and regulatory business environment (RBE) which is the focus of this novel study.

This implies that firms can allocate and employ larger amounts of retained earnings for investment and growth in developing countries with enabling RBEs because these firms perform better in these countries. This argument leads to the first hypothesis:

H1: An enabling institutional and RBE increases SMEs' funding from retained earnings in African countries.

The single most accessible form of external finance available in African developing countries is from commercial banks – as a result of the underdevelopment of financial institutions in these countries (Beck 2007; Quaye 2014). Even though commercial banks dominate available financial institutions in developing countries, SMEs still have difficulty accessing finance. This is because commercial banks are less exposed to SMEs due to their opaqueness and therefore charge higher fees and interests on loans granted to SMEs (Beck et al. 2008b; Quaye 2014). Commercial banks also attempt to reduce their lending risks by introducing varying and high demands for accessing finance, such as requests for physical collateral, which many SMEs find difficult to meet (Domeher 2012; Bond et al. 2015; Coetzee and Buys 2017). Hence, SMEs face enormous obstacles in accessing badly needed finance from banks in African countries (Yuko et al. 2015; Fowowe 2017; Quartey et al. 2017; Issaka Jajah et al. 2020). However, a more favourable institutional and RBE would mean banking institutions would have improved financial performance (Simerly and Li 2000; Forte and Tavares 2019), greater financial leverage (Weill 2008) and be capable of lending to SMEs. For instance, a commercial bank that has adequate support from the financial sector regulator where it operates, and perhaps incentives to lend to SMEs is more

likely to take actions that would make finance more accessible to SMEs. This may include the setting up of specialised desks and staff to aid SMEs. Thus, a favourable RBE is good for commercial banks, so they are more able to make funds accessible for SMEs.

A similar argument can be put forward for non-banking financial institutions. Non-banking financial institutions are often part of the shadow banking system in developing countries that provide lending to poorly financed businesses such as SMEs (Ghiţă-Mitrescu et al. 2016). For instance, microfinance institutions (MFIs) are helping bridge the access to financing gap in developing countries by adopting innovative ways to counteract obstacles faced by SMEs in accessing finance from commercial banks in Ghana (Quaye 2014). Rateiwa and Aziakpono (2017) noted that the economic role played by non-banking financial institutions was positively related to the macroeconomic environment in developing countries. This presupposes that non-banking financial institutions perform better and provide greater access to finance for firms in developing countries with favourable RBEs. Therefore, SMEs in developing countries with favourable RBEs would have greater supply or access to finance from banking and non-banking financial institutions. These arguments lead us to the second hypothesis:

H2: An enabling institutional and RBE increases SMEs' access to finance from financial institutions in African countries.

However, given that commercial banks in developing countries still charge high fees and interest on loans given to SMEs (Beck et al. 2008b; Quaye 2014) and that retained earnings is a cheaper alternative for SMEs (Bassetto et al. 2015; Mishra and Cooper 2017), it seems reasonable to allude that SMEs will not patronise bank finance if retained earnings are more readily available in an enabling RBE (Zabri et al. 2015; Paulo 2018). This leads to the third hypothesis.

H3: An enabling institutional and RBE decreases SMEs' funding from banking financial institutions in African countries.

As discussed hitherto, non-banking financial institutions are often part of the shadow banking system in developing countries that provide lending to poorly financed businesses such as SMEs (Ghiţă-Mitrescu et al. 2016). However, non-banking financial institutions such as MFIs charge even higher interest rates than banking institutions in developing countries, leading to low SME patronage. Ogujiuba et al. (2013) noted that many SMEs in Nigeria do not patronise loans from MFIs due to high interest rates charged by these institutions, which many SMEs cannot afford to repay. They add that some MFIs in Nigeria have collapsed due to defaults in loan repayment and high transaction costs (Ogujiuba et al. 2013). Based on these challenges, it is argued that SMEs in developing countries would not patronise funding from non-bank financial institutions (in the presence of adequate retained earnings) even if these are easily accessible in an enabling RBE. Hence, a fourth hypothesis is proposed:

H4: An enabling institutional and RBE decreases SMEs' funding from non-banking financial institutions in African countries.

SMEs in developing countries also turn to trade credit financing as a short-term alternative to bank finance when available (Ferrando and Mulier 2013). Huyghebaert (2006) posited that firms rely more on trade credit because suppliers are eager to finance 'unknown' firms than banks. Thus, trade credit is popular in developing countries and is considered a substitute for bank finance (Huang et al. 2011; Casey and O'Toole 2014). However, it is argued that the usefulness of trade credit is discounted in developing countries with enabling RBEs (where SMEs can have access to retained earnings) because trade credit cannot be diverted to other investments whereas affordable finance in the form of cash can be applied to many investments (Burkart and Ellingsen 2004). Hence, SMEs in African countries will opt for liquid cheap retained earnings over trade credit in places with enabling RBEs. It is, accordingly, conjectured that:

H5: An enabling institutional and RBE decreases SMEs' funding from trade credit in African countries.

Fig 4 provides the conceptual framework for this paper.

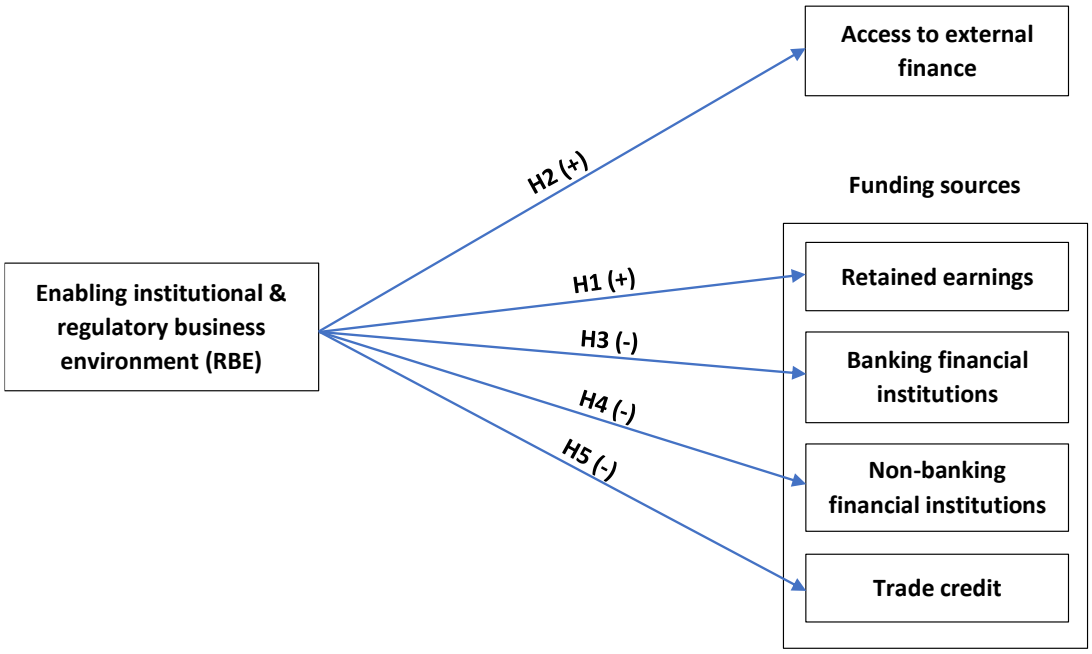


Figure 4. Conceptual framework (paper 1)

3. METHODOLOGY

3.1 Data and sample selection

The sample employed in this study is derived from the extensive World Bank Enterprise Surveys (WBES) database. The WBES, which began in 2002, is an ongoing World Bank project that collects objective data on the experiences and perceptions of enterprises in the World Bank member countries. It currently encompasses data on over 125,000 firms in 139 countries and covers a broad range of business environment topics, including access to finance, corruption, infrastructure, crime, competition, and performance measures. The surveys cover enterprises in the manufacturing and services sectors (World Bank 2019b).

A sample based on the latest available panel datasets on Africa from the WBES is selected. Out of the numerous countries in Africa where the World Bank conducts the enterprise surveys, there are only 28 countries with available panel datasets from which 27 datasets[10] are selected (please see Table 3). These datasets cover surveys undertaken between 2003 and 2019. Once logged in to the data section ('data by economy') of enterprisesurveys.org, the following search criteria is applied: for survey type – 'enterprise survey' and 'panel data.' Once this is applied, available African panel datasets come up from which panel datasets (i.e., datasets with 2 or more survey years) are selected. For instance, five datasets come up for Morocco with the search above, which are 2004–2007, 2007, 2013, 2013–2019, and 2019. Thus, only the 2004-

[10] The Ethiopia dataset is excluded because it did not have a panel id variable.

2007, and 2013-2019 datasets are selected. These datasets are then appended to each other yielding a rich total unbalanced panel sample of 33,205 firms (*n*), and 39,461 observations (*N*)[11] (see Table 3) (World Bank 2020b).

The African BE offers a unique representation of developing countries. Why? For instance, the Doing Business Report mentions that Sub Saharan Africa (SSA) remains one of the weakest business environments with an Ease of Doing Business (EODB) average score of 51.8, far below the global average of 63.0. Furthermore, this report notes that in SSA, it takes on average 21.5 days to undertake business registration compared to 11.9 in the European Union (World Bank 2020a). Clearly, the African BE offers a unique context for this study.

[11] Micro firms (0-4 employees) and large firms with up to 250 employees are included in this study, so the sample aligns with other studies and the more general definition of SMEs which is up to 250 employees – see for instance, the European Commission definition of SMEs (European Commission 2020)

Table 3. Sample description (please see Appendix 1)

Table 4. Variables (paper 1)

Variable	Definition	Obs (*N*)	Mean	Std. Dev	Min	Max
Panel A: Outcome variables (sources of funding for working capital and access to finance)						
Retained earnings or internally gen. funds	Finance from retained earnings or internal funds[a]	37,764	3.244	1.046	1	4
Banks 1 (public & private)	Finance from bank financial institutions, private and state-owned[a]	33,736	1.164	0.526	1	4
Banks 2 (public & private)	Finance from bank financial institutions (0 = if a firm does not have any line of credit or loan; 1= if a firm has a line of credit or loan from a financial institution and this credit is from a private commercial bank or from a state-owned bank or government agency)	37,392	0.127	0.332	0	1
Non-banks 1 (micro fin., coops., etc)	Finance from non-bank financial institutions which include microfinance institutions, credit cooperatives, credit unions, or finance companies[a]	35,865	1.025	0.210	1	4
Non-banks 2 (micro fin., coops., etc)	Finance from non-bank financial institutions (0 = if a firm does not have any line of credit or loan; 1= if a firm has a line of credit or loan from a financial institution and this credit is from non-bank financial institutions which include microfinance institutions, credit cooperatives, etc.)	37,392	0.012	0.111	0	1
Trade credit	Finance from trade credit from suppliers and advances from customers[a]	37,375	1.271	0.621	1	4
Access to finance 1	Subjective measure of constraints (obstacles) faced in accessing external finance (0= very severe obstacle; 1= major obstacle; 2= moderate obstacle; 3= minor obstacle; 4= no obstacle)	34,950	2.009	1.425	0	4
Access to finance 2	Objective measure of access to finance (1= Fully credit constrained; 2= Partially credit constrained; 3= Maybe credit constrained 4= Not credit constrained)	18,111	3.197	1.094	1	4

Panel B: Objective treatment variable (RBE)						
Ease of starting a business (registration, permits, etc)	The RBE proxied by the DB 'ease of starting a business' score [b]	38,457	0.536	0.499	0	1
Panel C: Subjective treatment variables (RBE)						
Tax administration	RBE of a firm proxied by how much of an obstacle tax administration poses to a firm (0= obstructive RBE; 1= enabling RBE)[c]	25,618	0.653	0.476	0	1
Business licensing & permit regulations	Reg BE of a firm proxied by how much of an obstacle business licensing & permit regulations pose to a firm (0= obstructive RBE; 1= enabling RBE)[c]	26,113	0.794	0.405	0	1
Customs & trade regulations	Reg BE of a firm proxied by how much of an obstacle customs & trade regulations pose to a firm (0= obstructive RBE; 1= enabling RBE)[c]	26,867	0.781	0.413	0	1
Panel D: Explanatory variables						
Size of firm	The size of a firm (measured by log of the number of employees)	39,446	2.955	1.366	0	10.309
Status of firm	Legal status of firm (1= Sole Proprietorship; 2= Partnership; 3= Limited Partnership; 4= Shareholding with traded shares; 5= Shareholding with non-traded shares; 6= Other)	37,721	3.034	1.005	1	6
Age of firm	The age of firm	13,949	16.825	13.945	0	168
Human capital of O/M	The human capital of the Owner/Manager (represented by years of business-related experience)	13,975	15.952	10.631	0	72
Gender of O/M	The gender of the Owner/Manager (0= Male; 1= Female)	25,691	0.140	0.347	0	1
Sector	The sector/industry of firm (1= Manufacturing e.g., fabrication, and publishing; 2 = Retail e.g., electronics and petroleum products; and 3 = Services e.g., motor garages, and IT)	31,911	1.821	0.884	1	3
Country	The country where firm is located (27 African countries in alphabetical order)[d]	39,461	15.105	6.337	1	27

Gross Domestic Product Per Capita	The log of the GDP per capita of the country where firm is located	39,461	7.353	0.756	5.543	8.769
Year	Year survey was conducted	39,461	2010.748	4.090	2003	2019

[a] (1= 0 to 25%; 2= 26 to 50%; 3= 51 to 75%; 4= 76 to 100% of working capital)

[b] Obstructive reg BE = firms in locations with scores up to the 50th percentile in the distribution; Enabling reg BE = firms in locations with EODB scores above the 50th percentile in the distribution

[c] Obstructive RBE = firms that considered specific regulation as a 'major obstacle' or 'severe obstacle' to their operations); Enabling RBE = firms that considered specific regulation as 'no obstacle' or 'minor obstacle' to their operations)

[d] The Ethiopia dataset is excluded because it did not have a panel id variable

3.2 Variables

3.2.1 Outcome variables

First, to consider the influence of the institutional and RBE on the funding choices of SMEs in African countries and following Troilo et al. (2019), four (4) sources of finance are selected as dependent variables from the sample. These four variables are responses to the question: What is the percentage of your working capital is financed by each of these four sources? These sources are (1) retained earnings or internally generated funds; (2) banking financial institutions, private and state-owned; (3) non-banking financial institutions which include microfinance institutions, credit cooperatives, credit unions, or finance companies; and (4) trade credit from suppliers and advances from customers. Following Quartey et al. (2017) these sources of funding variables are transformed to an ordinal scale. The transformed variables take the values 1 – 4 according to the following: 1 if a firm uses a source to fund 0-25% of working capital; 2 if a firm uses a source to fund 26-50% of working capital; 3 if a firm uses a source to fund 51-75% of working capital; and 4 if a firm uses a source to fund 76-100% of working capital.

Second, also included as dependent variables are additional measures of funding from banking and non-banking financial institutions in the sample. These two variables are constructed from two responses: (1) Does the firm have a line of credit or loan from a financial institution (0= No; 1= Yes); and (2) What is the type of institution that granted the line of credit or loan? (1= private commercial banks; 2= state-owned banks or government agency; 3= non-bank financial institutions which include microfinance institutions, credit cooperatives, etc; 4= others). Thus, a binary variable is constructed

to proxy funding from banking financial institutions, which takes the form zero (0) if a firm does not have any line of credit or loan; and one (1) if a firm has a line of credit or loan from a financial institution and this credit is from a private commercial bank or from a state-owned bank or government agency. Additionally, another binary variable is constructed to proxy funding from non-banking financial institutions which takes the form zero (0) if a firm does not have any line of credit or loan; and one (1), if a firm has a line of credit or loan from a financial institution and this credit, is from non-bank financial institutions which include microfinance institutions, credit cooperatives, etc.

Third, in line with the objective to consider how accessible external finance is to SMEs and following Fowowe (2017), a subjective measure of how accessible external finance is to SMEs is included. Respondents were asked if they faced constraints (or obstacles) in accessing external finance. Responses sought were 0= very severe obstacle; 1= major obstacle; 2= moderate obstacle; 3= minor obstacle; 4= no obstacle) (see Table 4). Additionally, an objective measure of access to finance following Kuntchev et al. (2013) is included. Using the WBES, Kuntchev et al. (2013) constructed 4 groups to represent the extent to which each firm was credit constrained. These 4 groups were (1) Full credit constrained (FCC); (2) Partially credit constrained (PCC); (3) Maybe credit constrained (MCC); and (4) Not credit constrained (NCC). The FCC is a group of firms that applied for external credit, were rejected, and currently do not have any lines of credit. They also include firms that did not use external sources of finance for their working capital and investments in the previous year. Fundamentally, these are firms that do not have access to external credit even though they need additional capital. The PCC group are firms that used external

sources of finance for their working capital and investments within the past year or had a line of credit at the time of the survey. However, such firms have recently applied for credit for reasons other than having enough capital or applied for a loan but was rejected. The MCC group used external sources of finance for working capital and investment during the past year or had a current line of credit. However, they have recently applied for credit and were successful. The NCC group includes firms that did not apply for credit recently simply because they had enough capital to meet the firm's needs. Thus, an objective ordinal variable on access to finance is constructed (where, 1= FCC; 2= PCC; 3= MCC; 4= NCC) following the groups of Kuntchev et al. (2013) (see Table 4).

3.2.2 Treatment variables

The institutional and RBE is proxied by the *ease of starting a business* (ESB) score of the World Bank's Doing Business project following similar studies (Munemo 2012; Hossian et al. 2018; Bosire 2019; Nketiah-Amponsah and Sarpong 2020). The Doing Business project of the World Bank was launched in 2002. It measures the impact business regulations have on SMEs across 190 economies. It analyses business regulations by measuring processes, obstacles, and time spent for obtaining business incorporation and building permits, electricity connection, transferring property, getting access to credit, protecting minority investors, paying taxes, engaging in international trade, enforcing contracts, and resolving insolvency (World Bank 2020a). The ESB component is an average score of the number of official procedures required to start up and formally operate a business, the cost to complete these procedures, and the paid-in minimum capital requirement. These procedures cover the processes

prospective business owners need to obtain approvals, licences, permits, and verifications from the relevant authorities. A high ESB score indicates that the institutional and RBE in a country is enabling and favourable for business activities. Hence, the ESB is a highly suitable proxy for the RBE of countries in this study (see Table 4).

Appropriate ESB scores (derived from the Doing Business online repository) are first assigned to each observation in the sample. Next, a treatment variable from the distribution of ESB scores allocated (see Table 6) is constructed. An ‘obstructive’ RBE (coded 0) refers to locations with ESB scores up to the 50th percentile in the distribution; an ‘enabling’ RBE (coded 1) refers to locations with ESB scores above the 50th percentile in the distribution.

Three (3) subjective variables in the sample that cover the impact of business regulations on firms are also employed following similar studies (Beck et al. 2005b; Carlin et al. 2006; Commander and Svejnar 2008). These variables are firm-level responses to the question: How much of an obstacle do the following business regulations pose to an enterprise: tax administration, business licensing & permits, and customs & trade regulations. Likert responses given are no obstacle; minor obstacle; moderate obstacle; major obstacle; and very severe obstacle. Treatment variables from these responses are constructed as follows: an ‘obstructive’ RBE (coded 0) refers to responses from firms that considered a specific regulation as a 'major obstacle' or 'severe obstacle' to their operations; an ‘enabling’ RBE are responses from firms that considered a specific regulation as 'no obstacle' or 'minor obstacle' to their operations.

These variables provide suitable subjective treatment variables for the quality of the RBE in developing countries and augment the objective treatment variable (see Table 4).

Subjective (firm-level) measures of the BE in countries are sometimes considered useful because country-level measures do not capture the institutional heterogeneity present in each country or regions with a country (Dollar et al. 2005; Dethier et al. 2011). Country-level measures also do not capture how each distinct firm is influenced by business regulation; this is necessary because each firm is influenced differently (Straub 2008).

3.2.3 Explanatory variables

Seven explanatory variables (covariates) are included. Five of these variables are firm-related factors and entrepreneur-related factors that influence the funding choices of SMEs. These five variables are the size of firm, measured by the number of employees; the legal status of firm; the age of firm; the human capital of the owner/manager (represented by years of experience of the owner/ manager); and the gender of the owner/manager.

The size of a firm is the most discussed firm-related factor that influences the funding choices of firms (Beck and Demirguc-Kunt 2006; Abor and Biekpe 2009; Yuko et al. 2015; Cowling et al. 2016; Moritz et al. 2016; Rostamkalaei and Freel 2016; Wang 2016). The size of a firm is positively associated with access to formal credit (Yuko et

al. 2015) with smaller firms opting for short-term debt (Abor and Biekpe 2009). The legal form (status) of firms can also influence their funding choices. It is generally asserted that informal firms prefer informal sources of finance and formal firms prefer formal sources of finance (Nkundabanyanga et al. 2014; Yuko et al. 2015; Coetzee and Buys 2017).

The education, experience, and gender of an owner or manager are a few of the entrepreneur-related factors explored in the literature that influence the funding choices of firms (Irwin and Scott 2010; Makler et al. 2013; Vasilescu 2014; Li 2015; Yuko et al. 2015; Pallegedara 2017). For instance, the financial literacy of an owner/manager improves access to formal finance for SMEs in developing countries (Yuko et al. 2015; Adomako et al. 2016). Additionally, SMEs with female owners in Sub-Saharan Africa were less likely to be credit-constrained than male-owned enterprises, but this is reversed for medium-sized enterprises, according to Hansen and Rand (2014).

Additionally, included are two other standard explanatory variables in the econometric analysis, the firm's sector of operation, and the GDP per capita of the country where the firm is located (Quartey et al. 2017; Troilo et al. 2019) (see Table 4).

3.3 Econometric method

Several data cleaning operations and preparations were performed to ensure the sample was suitable for analysis. These actions include eliminating ambiguous entries in the dataset, creating new panel ids for the pooled datasets, and recoding a few variables.

Traditionally, similar studies have employed regressions to analyse relationships involving the BE of firms. However, standard regressions are prone to multicollinearity, endogeneity issues, and self-selection biases (Dethier et al. 2011). Thus, the Propensity Score Matching (PSM) method is employed to test for treatment effects of an enabling institutional and RBE on access to finance and the funding choices of SMEs. PSM methods allow for a more accurate causal relationship to be established by countering a firm's factual analysis under control and treatment settings. This means it is possible to disentangle (or isolate) the influence of the RBE from other covariates that may well impact access to finance and the funding choices of SMEs (Phillipson et al. 2019). PSM methods also reduce selection bias (Cepeda et al. 2003) which may have occurred during the WBES sample collection.

Thus, firms operating in 'obstructive' RBEs are compared to firms operating in 'enabling' RBEs. Firms are matched by (covariates) size, status, age, the human capital of the owner/ manager, gender of owner/ manager, sector of operation, and the GDP per capita of the country where the firm is located. In addition, included is the survey year, so firms surveyed about the same period are matched. The PSM analysis is undertaken using *n* to ensure a firm is not matched to itself.

The matching process itself involves compressing the matching criteria (covariates) into a propensity score (which is the probability of the treatment on the covariates) and then comparing the sourcing of finance of individual firms with similar propensity scores across the control (obstructive RBE) and the treated (enabling RBE) groups. Generally, the propensity score is estimated with a logit (or probit) model where the binary treatment variable regresses on the covariates. Therefore, the logit regression model for the propensity score is as follows

$$Propensity\ score = \Pr\ (T_i = 1) = \beta_0\ +\ \beta_1\ Z_i\ +\ v_i\ \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(1)$$

Where *T* is the binary treatment variable capturing if a firm is either located in an obstructive (= 0) or enabling (= 1) RBE; *i* refers to each firm in the sample; *Z* refers to the set of matching criteria or covariates used in this study; and *v* refers to the unobserved error.

Once computed, the propensity scores form the basis for matching firms using several approaches. To ensure consistency (Wooldridge 2010), these approaches are employed: Nearest Neighbour Matching (NN) (also called Mahalanobis Distance Matching) proposed by Abadie and Imbens (2006), Inverse Probability Weighting (IPW), and Regression Adjustment (RA). For the matching quality to be acceptable, the balancing test needs to be satisfied where there are no significant differences between the covariate means across both control and treatment groups (Dehejia and Wahba 2002). Once the balancing test is successful, the average treatment effect on

the treated (ATET), which is the mean effect of firms that are treated (or firms that are located in enabling RBEs), can be computed (Wooldridge 2010).

Table 5. Descriptive statistics of funding for working capital (paper 1)

Source of funding	% of total working capital financed	No. of firm obs. (*N*)	Percentage
Retained earnings & internally gen. funds	0 to 25%	3,941	10.44
	26 to 50%	5,336	14.13
	51 to 75%	6,036	15.98
	76 to 100%	22,451	59.45
Total		37,764	100
Banks (public & private)	0 to 25%	29,989	88.89
	26 to 50%	2,532	7.51
	51 to 75%	648	1.92
	76 to 100%	567	1.68
Total		33,736	100
Non-bank (micro fin., coops., etc)	0 to 25%	35,219	98.2
	26 to 50%	482	1.34
	51 to 75%	71	0.2
	76 to 100%	93	0.26
Total		35,865	100
Trade credit	0 to 25%	30,068	80.45
	26 to 50%	5,220	13.97
	51 to 75%	1,371	3.67
	76 to 100%	716	1.92
Total		37,375	

Table 6. Descriptive statistics on objective RBE treatment (paper 1)

	Mean	Std. Dev.	Min	P25	Median	P75	Max	Obs. (*N*)
Ease of starting a business	66.498	17.299	17.4	57.4	73.5	80.6	93	38,457

Table 7. Probability of firm being in an enabling RBE (paper 1)

	Objective RBE	Subjective RBE		
	Ease of starting a business	Business licensing & permits	Customs & trade regulations	Tax administration
Size of firm	0.014	0.038*	-0.155***	0.025
	(0.023)	(0.022)	(0.020)	(0.019)
Age of firm	-0.410***	0.027	-0.000	-0.084***
	(0.034)	(0.032)	(0.030)	(0.028)
Status of firm	-0.050**	-0.058***	-0.018	-0.015
	(0.022)	(0.021)	(0.019)	(0.018)
Human capital of O/M	0.191***	0.002	-0.106***	-0.066**
	(0.036)	(0.033)	(0.031)	(0.029)
Gender of O/M	-0.619***	-0.143**	0.108*	0.117**
	(0.063)	(0.059)	(0.057)	(0.053)
Sector of firm	0.152***	0.057**	-0.005	0.033
	(0.027)	(0.025)	(0.023)	(0.022)
GDP per capita	3.409***	0.152***	0.439***	0.448***
	(0.049)	(0.027)	(0.029)	(0.024)
Country	0.065***	0.048***	0.053***	0.065***
	(0.003)	(0.004)	(0.003)	(0.003)
Year	0.672***	-0.001	-0.018***	-0.039***
	(0.012)	(0.006)	(0.006)	(0.006)
Constant	-1,378.572***	1.879	34.326***	74.542***
	(24.099)	(12.985)	(12.290)	(11.450)
Observations (*N*)	21,486	13,109	13,309	13,011
No. of firms (*n*)	19,415	12,242	12,408	12,125
Wald chi2(9)	5027.6***	232.49***	429.66***	954.66***

Notes: Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 8. ATET results of Nearest Neighbour Matching (3) using the objective treatment (paper 1)

			Sources of funding					
	Access to finance		Retained earnings	Bank institutions		Non- bank institutions		Trade credit
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
ATET	0.300***	0.384***	0.119***	-0.025	-0.045***	-0.009	0.003	0.015
	(0.051)	(0.049)	(0.040)	(0.018)	(0.013)	(0.008)	(0.003)	(0.017)
Observations:								
Total Raw	16,331	9,860	15,822	13,642	16,597	15,724	16,597	15,742
Total matched	19,562	12,884	19,050	14,640	19,886	18,812	19,886	18,830
Treated matched	9,781	6,442	9,525	7,320	9,943	9,406	9,943	9,415
Control matched	9,781	6,442	9,525	7,320	9,943	9,406	9,943	9,415

Notes: Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

ATET is average treatment effect on the treated

The following covariates are included in all models: size of firm, age of firm, status of firm, human capital of O/M, gender of O/M, sector of firm, year of survey, GDPC of country

Table 9. ATET results of Inverse Probability Weighting using the objective treatment (paper 1)

	Sources of funding							
	Access to finance		Retained earnings	Bank institutions		Non- bank institutions		Trade credit
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
ATET	0.159**	0.192***	0.183***	-0.028	-0.145***	-0.009	0.003	-0.021
	(0.068)	(0.055)	(0.059)	(0.030)	(0.024)	(0.015)	(0.003)	(0.032)
POM[a] (Enabling BE)	2.187***	3.324***	3.121***	1.218***	0.301***	1.035***	0.008**	1.230***
	(0.067)	(0.054)	(0.058)	(0.030)	(0.024)	(0.014)	(0.003)	(0.032)
Observations:								
Total raw	16,331	9,860	15,822	13,642	16,597	15,724	16,597	15,742
Total weighted	16,331	9,860	15,822	13,642	16,597	15,724	16,597	15,742
Treated weighted	8,722	5,463	8,441	7,168	8,912	8,380	8,912	8,388
Control weighted	7,609		7,381	6,474	7,685	7,344	7,685	7,354

Notes: Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

ATET is average treatment effect on the treated

[a] Potential outcome mean

The following covariates are included in all models: size of firm, status of firm, age of firm, human capital of O/M, gender of O/M, sector of firm, year of survey, GDPC of country

Table 10. ATET results of Regression Adjustment [a] using the objective treatment (paper 1)

	Sources of funding							
	Access to finance		Retained earnings	Bank institutions		Non- bank institutions		Trade credit
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
ATET	0.202***	0.077	0.175***	-0.063***	-0.083***	-0.021***	-0.001	0.020
	(0.047)	(0.049)	(0.031)	(0.018)	(0.014)	(0.007)	(0.002)	(0.017)
POM[b] (Enabling BE)	2.144***	3.439***	3.129***	1.252***	0.239***	1.047***	0.012***	1.189***
	(0.045)	(0.048)	(0.030)	(0.016)	(0.014)	(0.007)	(0.002)	(0.016)
Observations	16,331	9,860	15,822	13,642	16,597	15,724	16,597	15,742

Notes: Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

ATET is average treatment effect on the treated

[a] Outcome model is Poisson

[b] Potential outcome mean

The following covariates are included in all models: size of firm, status of firm, age of firm, human capital of O/M, gender of O/M, sector of firm, year of survey, GDPC of country

4. RESULTS AND DISCUSSION

4.1 Descriptive statistics

Fascinating descriptive statistics were noted concerning the sample employed in this study. For instance, 52.64% of firms are small firms (5 -19 employees), 28.26% are medium firms (20 – 99 employees), and 14.04% are large firms (100 – 250 employees). Moreover, only 5.16% are Sole Proprietorships, while 53.55% of firms are Limited Partnerships, and 19.84% are Partnerships[12]. Furthermore, 49.66% of firms operate in the manufacturing sector (which represent industries like plastics and rubber, textiles, garment making, and fabricated metal products), 31.75% in the service sector (which represent industries like IT, hospitality, auto repair, and entertainment), and 18.6 in the retail sector (which represent industries like household items and clothing, electronics, and petroleum products). These statistics present an interesting overview of businesses in Africa and demonstrate that most firms in Africa operate in low to medium-tech industries (Wintjes et al. 2014; Galindo-Rueda and Verger 2016; IMF 2018).

There were interesting details on the funding choices of SMEs in the sample. Firstly, the majority (59.45%) of SMEs financed 76 to 100% of their working capital with retained earnings. This contrasts with the majority (about 80-98%) of SMEs financing only 0 to 25% of their working capital from a bank, non- bank, and trade credit sources.

[12] The WBES sample employed in this study is based on formal registered firms.

These statistics indicate SMEs have high sourcing of retained earnings in contrast to low patronage of other sources of finance (see Table 5).

A wide distribution of ESB scores for the countries is also noted in the sample, ranging from 17.299 to 93. Interestingly, the mean ESB score in the sample of 66.5 is lower than the median score of 73.5 suggesting that the distribution is negatively skewed, which means there are more firms with low ESB scores that there are those with high scores (see Table 6).

4.2 Empirical results and discussion

Table 7 details the logit model results concerning the probability of a firm being in an 'enabling' RBE. Also noted is that it is more likely to find bigger firms in enabling RBEs when proxied by the ESB, business licensing and tax administration. Conversely, it is less likely to find older firms in enabling RBE when proxied by the ESB, customs & trade regulations and tax administration. An explanation for this may be that it is easier to start a business in an enabling RBE, so there would be younger (newer) firms in such places. This argument seems plausible since (from the logit estimates) it is also less likely to find SMEs with higher legal statuses (such as shareholding firms) in enabling RBEs, suggesting that there are newer and young firms with statuses (such as sole proprietorships and partnerships) usually attributed to new and young firms (Fajnzylber et al. 2011; Harati and Shamruk 2013; Skenderi et al. 2017). The balancing tests on whether there are no significant differences between the covariate means across both control and treatment groups was satisfied in almost all

matching estimations with differences in covariate weighted means negligible and variance ratios near 1.

Model (1) in Tables 7 to 9 and Appendices 2 to 4 employ the subjective access to finance outcome variable (*Access to finance 1*). Similarly, model (2) employs the objective access to finance outcome variable based on Kuntchev et al. (2013) (*Access to finance 2*). Model (3) employs the percentage of working capital funding from the retained earnings variable. Model (4) employs the percentage of working capital funding from banking financial institutions, private and state-owned variable (*Banks 1*). In contrast, model (5) employs the binary variable on funding from banking financial institutions (*Banks 2*). Model (6) employs the percentage of working capital funding from non-banking financial institutions, which include microfinance institutions, credit cooperatives, credit unions, or finance companies, variable (*Non-banks 1*). In contrast, model (7) employs the binary variable on funding from non-banking financial institutions (*Non-banks 2*). Model 8 employs the percentage of working capital funded from trade credit from suppliers and advances from customers variable.

The first hypothesis (H1) predicted that an enabling institutional and RBE increases SMEs' funding from retained earnings in African countries. The ATET results of all PSM methods support this prediction significantly using the objective treatment variable (Model (3), NN $\beta = 0.119$, $p<0.01$; IPW $\beta = 0.183$, $p<0.01$; RA $\beta = 0.175$, $p<0.01$) (see Tables 7 - 9). Very similar significant results using the subjective

treatment variables were obtained (see the model (3) in Appendices 2 to 4). In view of these results, H1 is supported.

Theoretically, there was a basis for predicting in H1 that an enabling institutional and RBE increases SMEs' funding from retained earnings in African countries (Bassetto et al. 2015; Zabri et al. 2015; Paulo 2018; Nguyen 2020). SMEs prefer funding from retained earnings over external finance in the first instance for investment, expansion, and growth (Bassetto et al. 2015; Mishra and Cooper 2017; Nguyen 2020) which is attributable to pecking order and /or trade off behaviour (Myers and Majluf 1984; Hussain et al. 2006; Bassetto et al. 2015; Mishra and Cooper 2017). However, the central argument herein is that these choices can be attributed to the availability of retained earnings gained from improved productivity and financial performance in enabling RBEs. In other words, SMEs can allocate and employ significant amounts of retained earnings for investment and growth in locations with enabling (or better) institutional and RBEs because they are most likely to have improved financial performance and make profits. These profits can then be applied as retained earnings to their businesses.

The second hypothesis (H2) predicted that an enabling institutional and RBE increases SMEs' access to finance from financial institutions in African countries. In other words, SMEs in enabling RBEs have better access to (or supply of) finance from financial institutions in African countries. The ATET results from the PSM methods on access to finance support this prediction significantly using the objective treatment variable (Model (1), NN $\beta = 0.300$, $p<0.01$; IPW $\beta = 0.159$, $p<0.05$; RA $\beta = 0.202$,

$p<0.01$; and model (2), NN $\beta = 0.384$, $p<0.01$; IPW $\beta = 0.192$, $p<0.01$; RA $\beta = 0.077$) (see Tables 7 - 9). Furthermore, similar significant results for the subjective treatment variables are noted (see models (1) and (2) in Appendices 2 to 4). Thus, the second hypothesis (H2) is empirically supported.

Commercial banks dominate financial institutions in African countries, yet SMEs generally have difficulty accessing finance because commercial banks are less exposed to SMEs and charge higher fees and interests on loans granted to SMEs (Beck et al. 2008b; Quaye 2014). However, an enabling RBE would mean banking institutions would have improved financial performance (Simerly and Li 2000; Forte and Tavares 2019), greater financial leverage (Weill 2008) and be capable of lending to SMEs, which are otherwise considered risky clients leading to greater access to bank finance for SMEs. For instance, a commercial bank that has adequate support from the financial sector regulator and perhaps incentives to lend to SMEs would be more likely to put in measures to counter the hurdles normally faced by banks in understanding the needs of SMEs. Perhaps, this would include setting up special packages, desks and allocating staff to address the needs of SMEs. Indeed, an enabling institutional and RBE should certainly make access to finance more accessible from banks. Moreover, non-banking financial institutions which are part of the shadow banking system in developing countries also provide lending to poorly financed businesses such as SMEs (Ghiţă-Mitrescu et al. 2016). These institutions are also more likely to provide greater access to finance for SMEs in an enabling RBE because these institutions would have a better regulatory environment to thrive. But would SMEs in enabling institutional and RBEs employ accessible finance from financial institutions?

The third (H3) hypothesis predicted that an enabling institutional and RBE decreases SMEs' funding from banking institutions in African countries. The ATET results of the PSM methods generally support this prediction using the objective treatment variable (Model (4), NN β = -0.025; IPW β = -0.028; RA β = -0.063, $p<0.01$; and model (5), NN β = -0.045, $p<0.01$; IPW β = -0.145, $p<0.01$; RA β = -0.083, $p<0.01$) (see Tables 7 - 9). Furthermore, similar, and significant results for the subjective treatment variables are noted (see models (4) and (5) in Appendices 2 to 4). Thus, the third hypothesis (H3) is accepted. Additionally, the fourth hypothesis (H4) predicted that an enabling institutional and RBE decreases SMEs' funding from non-banking financial institutions in African countries. The ATET results from the PSM methods partially support this prediction, but the estimates are generally not significant using the objective treatment variable (Model (6), NN β = -0.009; IPW β = -0.009; RA β = -0.021, $p<0.01$; and model (7), NN β = 0.003; IPW β = 0.003; RA β = -0.001) (see Tables 6 - 8). Furthermore, similar results for the subjective treatment variables are noted (see models (6) and (7) in Appendices 2 to 4). Thus, the fourth hypothesis is partially supported.

These results are in line with the argument that even though the access (or supply) of finance from banking and non-banking financial institutions increases in an enabling institutional and RBE, SMEs fail to take advantage of this supply and opt for retained earnings. This is because commercial banks in developing countries still charge high fees and interest on loans given to SMEs (Beck et al. 2008b; Quaye 2014) making them unattractive to SMEs. Moreover, retained earnings is a cheaper alternative for

SMEs (Bassetto et al. 2015; Mishra and Cooper 2017) and SMEs in enabling RBEs certainly have greater amounts of this because they are more likely to have improved financial performance. So, SMEs in favourable RBEs in African countries are less likely to employ funding from banking financial institutions even if these are available.

According to Rateiwa and Aziakpono's (2017) study (based on a sample of firms in Egypt, Nigeria, and South Africa), non-banking financial institutions perform better and provide greater access to finance for firms in developing countries with favourable Bes, however, SMEs are not keen to seek this form of finance. This is so because non-bank financial institutions like MFIs charge high interest rates leading to defaults in repayment (Ogujiuba et al. 2013). Thus, SMEs in African developing countries do not patronise finance from non-bank financial institutions (in the presence of adequate retained earnings) even if these are easily accessible, as would be the case in countries with enabling RBEs.

The fifth hypothesis (H5) predicted that an enabling institutional and RBE decreases SMEs' funding from trade credit in African countries. The ATET results from the PSM methods do not provide support for this prediction and are generally not significant using the objective treatment variable (Model (8), NN $\beta = 0.015$; IPW $\beta = -0.021$; RA $\beta = 0.020$) (see Tables 7 - 9). Furthermore, similar generally insignificant results for the subjective treatment variables are noted (see model (8) in Appendices 2 to 4). Thus, the fifth hypothesis (H5) is not supported.

Even though this hypothesis is not supported empirically in this study, which may be due to the limited observations in the sample that relate to the use of trade credit, there is theoretical backing that the usefulness of trade credit is discounted in countries with enabling RBEs (that promote greater access to finance from retained earnings) because trade credit cannot be diverted to other investments. In contrast, affordable finance in cash can be applied to many investments (Burkart and Ellingsen 2004). Hence, SMEs would opt for retained earnings over trade credit in enabling RBEs.

4.3 Robustness check

A robustness check is conducted by introducing an inflation variable in the empirical model – following some similar studies (Aterido et al. 2011; Dinh et al. 2012; Fowowe 2017) – and then running the logit regressions and PSM analyses again. The results from these checks closely match the main results presented in this paper (see Appendices 5 to 8).

5. CONCLUSION

This study seeks to better understand the influence of the institutions and the RBE on access to finance and the funding choices of SMEs in African countries.

The empirical analyses provide interesting indications of access to finance and SME funding choices in African countries. A key finding in this study is that access to (or

the supply of) finance increases in African countries with enabling institutional and RBEs, however, this increased supply does not translate to greater patronage by SMEs. This is because external forms of finance in African countries remain relatively expensive even though available, thus, typically SMEs will opt for retained earnings over any form of external finance. This fine thread shows that progress has been made in making finance accessible to SMEs in some African countries, but there remains the hurdle of affordability. SMEs have unique challenges and characteristics so try to avoid costly debt that may be detrimental to their businesses.

This study contributes to literature in the following ways. First, it provides new evidence of the influence of institutions and the RBE on SME funding choices, unlike most studies that focus on the influence of firm-related and entrepreneur-related factors. Second, it contributes to literature on how institutions and the RBE impact access to (or the supply of) finance for SMEs. It demonstrates that the institutional and RBE might be more reliable measures of the BE's impact on the operations of firms than other traditional measures such as macroeconomic indicators. Third, by proxying the RBE with both objective and subjective regulatory measures, this study contributes to a clearer understanding of how regulatory institutions contribute to the overall BE. Fourth, this study demonstrates that subjective measures of the BE are complimentary to objective measures and that these do not just reflect firm experiences but are reliable measures of the BE.

These findings richly contribute to scholarly understanding of the funding behaviour of SMEs in African countries. These insights present a fundamental challenge to policy

makers, governments, donor agencies, financial institutions, and so forth on tailoring interventions and properly aligning measures and initiatives aimed at making varied, affordable finance available for SMEs in African countries. These interventions may include the provision of credit infrastructure (credit bureaus, collateral registries), credit guarantees, secured transaction reforms, and matching grants as suggested by the World Bank (Bruhn 2016; World Bank 2019a). These findings also support measures and initiatives (such as regulatory reform, business registration reform and business skills and practices training) aimed at bolstering institutional support for firms in African countries (Bruhn 2016; Ayyagari et al. 2017; World Bank 2019a). This, in turn, would significantly improve the overall quality of the BE in African countries.

This study is limited to African countries; therefore, it would be exciting for similar studies to be conducted in other regions. It would also be exciting to consider in future studies funding for investment in equipment and emerging alternative funding sources (such as, bonds, equity, business angels, crowdfunding) since these are not currently popular and well developed in the context of Africa.

6. APPENDICES

Appendix 1: Results of regressions used in estimating the control and treated POMs in Regression Adjustment Estimator

	Access to finance				Sources of finance: Retained earnings		Sources of finance: Bank institutions			
	Model 1		Model 2		Model 3		Model 4		Model 5	
	A	B	A	B	A	B	A	B	A	B
Constant	-81.966***	7.232*	-51.120***	-10.985***	10.757***	-4.840*	-5.039	19.993***	-47.216**	105.270***
	(7.327)	(4.238)	(5.557)	(2.775)	(2.872)	(2.733)	(3.600)	(4.389)	(18.598)	(20.477)
Size of firm	0.070***	0.068***	0.025***	-0.006*	-0.024***	-0.003	0.049***	0.050***	0.328***	0.346***
	(0.009)	(0.005)	(0.006)	(0.003)	(0.004)	(0.003)	(0.006)	(0.005)	(0.024)	(0.020)
Age of firm	-0.068***	-0.001	-0.018**	0.009**	-0.014**	-0.011***	0.003	0.004	0.005	0.049
	(0.013)	(0.008)	(0.009)	(0.004)	(0.006)	(0.004)	(0.009)	(0.009)	(0.037)	(0.030)
Status of firm	-0.011	-0.021***	-0.003	-0.011***	0.007*	-0.004	0.001	0.008	0.011	0.017
	(0.009)	(0.005)	(0.005)	(0.003)	(0.004)	(0.003)	(0.006)	(0.006)	(0.023)	(0.022)
Human capital of O/M	-0.025*	-0.048***	0.000	0.002	-0.001	0.010**	0.036***	0.022**	0.248***	0.093***
	(0.014)	(0.008)	(0.010)	(0.005)	(0.006)	(0.005)	(0.010)	(0.009)	(0.045)	(0.035)
Gender of O/M	0.021	-0.020	0.026	-0.035***	0.006	-0.013	-0.015	-0.000	-0.029	0.297***
	(0.024)	(0.019)	(0.017)	(0.012)	(0.011)	(0.011)	(0.016)	(0.017)	(0.075)	(0.066)
Sector of firm	0.084***	0.024***	0.020***	0.008**	0.003	-0.003	0.019***	0.027***	0.098***	0.024
	(0.011)	(0.006)	(0.008)	(0.004)	(0.005)	(0.004)	(0.007)	(0.006)	(0.029)	(0.025)
GDP per capita	0.063***	0.147***	0.048***	0.106***	-0.029***	0.035***	0.023***	-0.142***	0.181***	-0.643***
	(0.014)	(0.014)	(0.009)	(0.009)	(0.005)	(0.008)	(0.008)	(0.012)	(0.037)	(0.039)
Year	0.041***	-0.004*	0.026***	0.006***	-0.005***	0.003**	0.002	-0.009***	0.021**	-0.051***
	(0.004)	(0.002)	(0.003)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.009)	(0.010)
Observations	16,331	16,331	9,860	9,860	15,822	15,822	13,642	13,642	16,597	16,597

Notes: Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

POM is Potential outcome mean

Model A = Potential outcome mean for control (Obstructive reg BE)

Model B = Potential outcome mean for treatment (Enabling reg BE)

Appendix 1 (cont.): Results of regressions used in estimating the control and treated POMs in Regression Adjustment Estimator

	Sources of funding					
	Non- bank institutions				Trade credit	
	Model 6		Model 7		Model 8	
	A	B	A	B	A	B
Constant	-4.333**	-1.771	25.004	-39.891	17.300***	32.855***
	(1.899)	(1.895)	(57.997)	(86.556)	(4.193)	(3.707)
Size of firm	-0.005	-0.006***	-0.253**	-0.238**	0.025***	-0.006
	(0.003)	(0.002)	(0.110)	(0.100)	(0.006)	(0.005)
Age of firm	0.000	-0.001	0.035	0.228**	0.037***	0.007
	(0.005)	(0.002)	(0.126)	(0.112)	(0.010)	(0.006)
Status of firm	-0.006*	-0.002	-0.132	-0.057	-0.003	0.008*
	(0.003)	(0.002)	(0.082)	(0.086)	(0.006)	(0.005)
Human capital of O/M	-0.001	-0.005*	0.387***	-0.257**	-0.016	0.022***
	(0.005)	(0.003)	(0.133)	(0.129)	(0.010)	(0.007)
Gender of O/M	-0.006	0.015*	0.202	0.407	0.007	0.024
	(0.008)	(0.008)	(0.236)	(0.261)	(0.016)	(0.016)
Sector of firm	-0.002	-0.001	-0.030	-0.138	-0.007	-0.033***
	(0.004)	(0.002)	(0.107)	(0.114)	(0.007)	(0.005)
GDP per capita	-0.001	-0.012**	-0.319**	-0.344*	0.017**	-0.006
	(0.004)	(0.006)	(0.129)	(0.203)	(0.008)	(0.010)
Year	0.002**	0.001	-0.013	0.019	-0.009***	-0.016***
	(0.001)	(0.001)	(0.029)	(0.043)	(0.002)	(0.002)
Observations	15,724	15,724	16,597	16,597	15,742	15,742

Notes: Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

POM is Potential outcome mean

Model A = Potential outcome mean for control (Obstructive reg BE)

Model B = Potential outcome mean for treatment (Enabling reg BE)

Appendix 2: ATET results for Nearest Neighbour Matching (3) using subjective RBE treatment variables

			Sources of funding					
	Access to finance		Retained earnings	Bank institutions		Non- bank institutions		Trade credit
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Tax administration	0.791***	0.269***	0.144***	-0.041**	-0.003	-0.007	-0.011***	-0.052**
	(0.036)	(0.042)	(0.033)	(0.020)	(0.011)	(0.008)	(0.003)	(0.024)
Business licensing & permits	0.882***	0.225***	0.079**	-0.044**	0.004	0.004	-0.005	0.005
	(0.037)	(0.045)	(0.031)	(0.019)	(0.011)	(0.007)	(0.004)	(0.017)
Customs & trade regulations	0.644***	0.195***	0.095***	-0.042**	-0.005	-0.001	-0.007*	0.006
	(0.034)	(0.040)	(0.031)	(0.017)	(0.010)	(0.007)	(0.004)	(0.015)
Observations[a]	9,855	5,563	9,479	9,498	9,995	9,494	9,995	9,500

Notes: Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

ATET is average treatment effect on the treated

[a] Raw observations for Tax admin. models only; other reg BE variables present similar raw observations

For brevity, matched (control and treated) observations are also not shown

Appendix 3: ATET results for Inverse Probability Weighting using subjective RBE treatment variables

	Access to finance		Sources of funding					
			Retained earnings	Bank institutions		Non- bank institutions		Trade credit
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Tax administration	0.853***	0.223***	0.125***	-0.030**	0.006	-0.008	-0.013***	-0.016
	(0.029)	(0.034)	(0.025)	(0.013)	(0.008)	(0.006)	(0.003)	(0.013)
Business licensing & permits	0.898***	0.209***	0.095***	-0.023	0.012	0.006	-0.004	0.006
	(0.030)	(0.037)	(0.028)	(0.015)	(0.009)	(0.006)	(0.003)	(0.014)
Customs & trade regulations	0.691***	0.172***	0.145***	-0.052***	-0.022**	-0.004	-0.004	0.008
	(0.031)	(0.035)	(0.027)	(0.015)	(0.009)	(0.006)	(0.003)	(0.013)
POM[a] (Enabling BE)	1.518***	3.092***	3.149***	1.221***	0.176***	1.043***	0.023***	1.216***
	(0.024)	(0.030)	(0.022)	(0.011)	(0.007)	(0.005)	(0.003)	(0.011)
Observations[b]	9,855	5,563	9,479	9,498	9,995	9,494	9,995	9,500

Notes: Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

ATET is average treatment effect on the treated

[a] Potential outcome mean for Tax admin. model only; other reg. BE variables present similar means

[b] Raw observations for Tax admin. models only; other reg. BE variables present similar raw observations

For brevity, matched (control and treated) observations are also not shown

Appendix 4: ATET results for Regression Adjustment using subjective RBE treatment variables

	Access to finance		Sources of funding: Retained earnings	Bank institutions		Non- bank institutions		Trade credit
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**
Tax administration	0.878***	0.241***	0.129***	-0.032**	0.005	-0.010	-0.013***	-0.022
	(0.030)	(0.035)	(0.026)	(0.014)	(0.008)	(0.007)	(0.003)	(0.014)
Business licensing & permits	0.913***	0.218***	0.090***	-0.020	0.013	0.006	-0.004	0.004
	(0.030)	(0.038)	(0.027)	(0.015)	(0.009)	(0.006)	(0.003)	(0.014)
Customs & trade regulations	0.698***	0.167***	0.139***	-0.050***	-0.023***	-0.004	-0.004	0.006
	(0.032)	(0.036)	(0.028)	(0.015)	(0.009)	(0.006)	(0.003)	(0.013)
POM[a] (Enabling BE)	1.494***	3.074***	3.145***	1.224***	0.176***	1.045***	0.023***	1.222***
	(0.024)	(0.031)	(0.022)	(0.012)	(0.007)	(0.006)	(0.003)	(0.012)
Observations[b]	9,855	5,563	9,479	9,498	9,995	9,494	9,995	9,500

Notes: Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

ATET is average treatment effect on the treated

[a] Potential outcome mean for Tax admin. model only; other reg. BE variables present similar means

[b] Raw observations for Tax admin. models only; other reg. BE variables present similar raw observations

For brevity, matched (control and treated) observations are also not shown

Appendix 5: Robustness results - Probability of firm being in an enabling RBE

	Objective RBE	Subjective RBE		
	Ease of starting a business	Business licensing & permits	Customs & trade regulations	Tax administration
Size of firm	0.006	0.038*	-0.154***	0.025
	(0.023)	(0.022)	(0.020)	(0.019)
Age of firm	-0.407***	0.028	-0.002	-0.092***
	(0.035)	(0.032)	(0.030)	(0.028)
Status of firm	-0.083***	-0.058***	-0.020	-0.025
	(0.022)	(0.021)	(0.019)	(0.018)
Human capital of O/M	0.269***	-0.000	-0.101***	-0.028
	(0.037)	(0.033)	(0.031)	(0.029)
Gender of O/M	-0.671***	-0.141**	0.105*	0.095*
	(0.064)	(0.059)	(0.057)	(0.053)
Sector of firm	0.201***	0.057**	-0.004	0.039*
	(0.028)	(0.025)	(0.023)	(0.022)
GDP per capita	3.467***	0.151***	0.443***	0.465***
	(0.051)	(0.028)	(0.030)	(0.024)
Inflation	0.091***	-0.002	0.006	0.039***
	(0.005)	(0.004)	(0.004)	(0.004)
Country	0.079***	0.047***	0.053***	0.068***
	(0.004)	(0.004)	(0.003)	(0.003)
Year	0.709***	-0.002	-0.016***	-0.027***
	(0.012)	(0.007)	(0.006)	(0.006)
Constant	-1,454.605***	3.127	30.808**	49.644***
	(25.313)	(13.247)	(12.509)	(11.715)
Observations (*N*)	21,486	13,109	13,309	13,011
No. of firms (*n*)	19,415	12,242	12,408	12,125
Wald chi2(9)	4913.37***	232.98***	430.36***	1043.35***

Notes: Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix 6: Robustness results - ATET results of Nearest Neighbour Matching (3) using the objective treatment

	Access to finance		Sources of finance: Retained earnings	Bank institutions		Non- bank institutions		Trade credit
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
ATET	0.293***	0.248***	0.136***	-0.049**	-0.075***	-0.012	0.000	-0.008
	(0.042)	(0.041)	(0.037)	(0.020)	(0.013)	(0.011)	(0.002)	(0.018)
Observations:								
Total Raw	16,331	9,860	15,822	13,642	16,597	15,724	16,597	15,742
Total matched	19,562	12,884	19,050	14,640	19,886	18,812	19,886	18,830
Treated matched	9,781	6,442	9,525	7,320	9,943	9,406	9,943	9,415
Control matched	9,781	6,442	9,525	7,320	9,943	9,406	9,943	9,415

Notes: Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

ATET is average treatment effect on the treated

The following covariates are included in all models: size of firm, age of firm, status of firm, human capital of O/M, gender of O/M, sector of firm, year of survey, GDPC of country, and inflation

Appendix 7: Robustness results - ATET results of Inverse Probability Weighting using the objective treatment

	Access to finance		Sources of finance: Retained earnings	Bank institutions		Non- bank institutions		Trade credit
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**
ATET	0.135*	0.183***	0.178***	-0.035	-0.165***	-0.008	0.003	-0.033
	(0.071)	(0.055)	(0.061)	(0.032)	(0.026)	(0.015)	(0.003)	(0.035)
POM[a] (Enabling BE)	2.211***	3.333***	3.126***	1.224***	0.321***	1.034***	0.008**	1.242***
	(0.070)	(0.054)	(0.060)	(0.032)	(0.026)	(0.015)	(0.003)	(0.035)
Observations:								
Total raw	16,331	9,860	15,822	13,642	16,597	15,724	16,597	15,742
Total weighted	16,331	9,860	15,822	13,642	16,597	15,724	16,597	15,742
Treated weighted	8,722	5,463	8,441	7,168	8,912	8,380	8,912	8,388
Control weighted	7,609		7,381	6,474	7,685	7,344	7,685	7,354

Notes: Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

ATET is average treatment effect on the treated

[a]Potential outcome mean

The following covariates are included in all models: size of firm, status of firm, age of firm, human capital of O/M, gender of O/M, sector of firm, year of survey, GDPC of country, and inflation

Appendix 8: Robustness results - ATET results of Regression Adjustment using the objective treatment

			Sources of finance					
	Access to finance		Retained earnings	Bank institutions		Non- bank institutions		Trade credit
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
ATET	0.149***	0.061	0.193***	-0.055***	-0.091***	-0.017**	0.001	0.010
	(0.050)	(0.050)	(0.033)	(0.018)	(0.015)	(0.008)	(0.002)	(0.017)
POM[b] (Enabling BE)	2.197***	3.455***	3.111***	1.245***	0.247***	1.043***	0.009***	1.198***
	(0.048)	(0.049)	(0.031)	(0.017)	(0.015)	(0.007)	(0.002)	(0.016)
Observations	16,331	9,860	15,822	13,642	16,597	15,724	16,597	15,742

Notes: Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

ATET is average treatment effect on the treated

[a]Outcome model is Poisson

[b]Potential outcome mean

The following covariates are included in all models: size of firm, status of firm, age of firm, human capital of O/M, gender of O/M, sector of firm, year of survey, GDPC of country, and inflation

CHAPTER FOUR - THE IMPACT OF THE REGULATORY BUSINESS ENVIRONMENT ON THE PERFORMANCE OF SMES IN DEVELOPING COUNTRIES - NEW EVIDENCE FROM AFRICA

4.1 CHAPTER OVERVIEW

This chapter presents the second of four papers that address the objectives of this PhD study. It explores how elements within the BE – institutions and the RBE – impact the financial performance of SMEs in African countries.

THE IMPACT OF THE REGULATORY BUSINESS ENVIRONMENT ON THE PERFORMANCE OF SMES IN DEVELOPING COUNTRIES - NEW EVIDENCE FROM AFRICA

ABSTRACT

While extant literature indicates an enabling business environment (BE) improves the performance of small and medium-sized enterprises (SMEs) in developing countries, there is a dearth of literature that isolates and disaggregates the regulatory dimension of the BE when considering its impact on the performance of SMEs. Using regressions and Propensity Score Matching methods, evidence is unearthed to suggest that not all dimensions of an enabling regulatory business environment (RBE) enhance the performance of SMEs in developing countries, particularly Africa. It is found that, while an enabling business licensing and tax administration environment improves the performance of SMEs, an enabling trade facilitation environment impedes the performance of SMEs. These findings suggest that initiatives aimed at improving the RBE in developing countries need to be fine-tuned so they benefit SMEs. For instance, trade facilitation needs to be carefully thought through and implemented so that SMEs are not disadvantaged.

Key words: SMEs; business environment, regulatory institutions, developing countries; performance

1. INTRODUCTION

Small and medium-sized enterprises (SMEs) contribute up to 70% of GDP in many countries and often serve as a driver for economic growth (Beck et al. 2005a; Ayyagari et al. 2007); consequently, there is no shortage of literature on the operations and challenges of SMEs. Quite intriguing, however, are studies that have focused on the impact of the business environment (hereafter BE), (also referred to as business climate or investment climate) on the performance of SMEs. Broadly speaking, the BE is determined by factors such as the macroeconomic environment, infrastructure; security; political, social, and technological factors; and the legal and regulatory framework (Dethier et al. 2011; Belas et al. 2019). The main theme of literature on the BE is that it steers almost all entrepreneurial activity. A good BE impacts firms' performance, increases opportunities for investment, and creates competition according to the World Bank; hence improving the BE for firms should be a top priority for Governments (World Bank 2004, 2020a).

The African business environment presents an interesting reflection of the opportunities and challenges available in developing countries. For instance, the World Bank expects real domestic product (real GDP) in sub-Saharan Africa to grow by 2.8% in 2021, and 3.1% in 2022 despite the detrimental effects of the COVID-19 pandemic (World Bank 2021c). On the other hand, African countries collectively have one of the poorest business environments in the world, with an Ease of Doing Business (EODB) average score of 51.8, far below the global average of 63.0 (World Bank 2020a). Nevertheless, despite a pool of literature on the impact of the general BE on

the performance of SMEs in developing countries (Dollar et al. 2005; Escribano and Guasch 2005; Agboli and Ukaegbu 2006; Carlin et al. 2006; Commander and Svejnar 2008; Kinda 2010; Goel 2012; Ipinnaiye et al. 2017; Belas et al. 2019), and in advanced economies (Lee 2014; McCann and Ortega-Argilés 2016; Harju et al. 2019), there is a dearth of literature that isolates and disaggregates the regulatory dimension of the BE when considering its impact on the performance of SMEs in Africa. It is argued that disaggregating the regulatory business environment (hereafter, RBE) is imperative because not all dimensions of an enabling RBE would necessarily improve the performance of SMEs. For instance, while an enabling business licensing and registration environment (which includes easy access to affordable business registration services, among others), would in most cases improve the operations and performance of many firms (Alfaro and Chari 2014; Fernandes et al. 2018), trade liberalization (or facilitation) may not impact the operations and performance of all firms in the same way (Hunt et al. 2007; Terzİ 2010; Siddiqui 2015). Whereas some firms may experience the increased performance due to access to foreign consumers, other firms may experience decreased sales or performance due to the competition from foreign firms (Bas and Ledezma 2020). Thus, considering how different components of the RBE impact SMEs' performance is important in understanding and addressing some of the many challenges of SMEs in African countries.

Consequently, this study extends the research agenda on the impact of the institutional and RBE on the operations and performance of SMEs in African developing countries. It aligns with calls from the World Bank for such studies to inform policy directions (World Bank 2020a). It demonstrates that the institutional and RBE might be more reliable measures of the BE’s impact on the operations of firms than other traditional

measures such as macroeconomic indicators. It goes further than the few similar studies centred on the RBE (Goel 2012) by demonstrating that various components of the RBE have substantial differing impacts on the performance of SMEs in developing countries. Empirically, this study demonstrates these differing impacts using objective and subjective proxies of the RBE and go beyond most similar BE studies that rely on standard regressions (which are prone to issues of endogeneity and self-selection bias) by employing Propensity Score Matching (PSM) methods (Dethier et al. 2011). This study also employs the latest available cross-country panel datasets from the World Bank Enterprise Surveys.

The findings indicate that while an enabling business licensing and tax administration environment improves the performance of SMEs, an enabling trade facilitation environment limits the performance of SMEs in African countries. These findings support the need to fine-tune policy initiatives to improve the RBE in African countries.

The rest of the paper is structured as follows: the second section presents the theoretical arguments and hypotheses; the third section presents the data and empirical methods employed; the fourth presents the results and discussion; and finally, the fifth concludes the study.

2. DOES AN ENABLING REGULATORY BUSINESS ENVIRONMENT IN DEVELOPING COUNTRIES ALWAYS INCREASE THE PERFORMANCE OF SMES?

Selznick (1957) suggested that firms are adaptive structures that are shaped in reaction to their external environment and the actions of participants within the firm. In the 1990s Khanna and Palepu (1997) explained that institutional voids are the absence or underdevelopment of institutions that support markets. They are macroeconomic situations where arrangements that support markets are weak, or do not perform as expected (Mair and Marti 2009). Some authors portray institutional voids as regulatory weaknesses. For instance, they emphasise the absence of government regulation and show how firms respond to voids (Aidis 2005; Mair and Marti 2009; Puffer et al. 2010; Stal and Cuervo-Cazurra 2011). Other authors emphasize the absence of infrastructure or the prevalence of corruption and its bearing on how firms operate and the flow of investment (Agboli and Ukaegbu 2006; Ihua 2009; Kinda 2010). Yet still other authors focus on the vacuum created by inadequate political institutions and their effect on business activities (Luiz and Ruplal 2013; Goel et al. 2017; Williams 2018).

No doubt African countries like many developing countries struggle to provide institutions to support their markets (Beck et al. 2008b). When present, these institutional arrangements are often ineffective or obstructive (Xiaowei and Chi-Nien 2013). In general, there are a number of institutional voids (peculiar to developing countries) that are faced by SMEs which include inadequate access to formal business registration and support services (such as entrepreneurial capacity building), poor

access to essential finance and public services (e.g. for training and innovation), poor tax regimes (which include high taxes), poor and sometimes outdated labour regulations (such as minimum wage requirements, labour protection, health and safety regulations) among others. These constraints typically hinder the operations and performance of SMEs (Weill 2008; Dethier et al. 2011). This paper focuses specifically on three general dimensions of regulatory institutions that impact the economic performance of most firms in African countries (World Bank 2020a).

The RBE in Africa like many developing countries, while being unique is fraught with many inadequacies. For instance, regulatory institutions responsible for licensing and permits for businesses in developing countries are often ineffective, leading to high numbers of unlicensed businesses and even business failures (Devas and Kelly 2001). The same is true even in some developed countries, Friedberg et al. (2004) noted that over one-third of Israeli business is unlicensed partly due to oversight failures in licence regulation. They pointed to inactions, slow and ineffective policy implementation, and failure to enact policy changes when difficulties were noted. Many firms in developing countries also report that restrictions on access to appropriate licensing and permits force them to obtain licenses and permits fraudulently leading to high monetary and non-monetary effects on their businesses (Goel 2012; Giang et al. 2016).

Conversely, adequate access to business registration and other business support services are invaluable to the survival and performance of SMEs. For example, Fernandes et al. (2018) noted a marked improvement in firms' productivity in Portugal

after business entry reforms were implemented in 2005. They also found that these reforms boosted competition which spilt over to increased performance. Moreover, Alfaro and Chari (2014) noted an increase in the number of firms in industries with easier start up-regulation in India, and Demenet et al. (2016) noted a 20% increase (on average) in the value of firms when start-up reform was implemented in Vietnam. In essence, these arguments show that an enabling business licensing and permit environment in developing countries should increase the performance of SMEs. Thus, it is hypothesized that:

H1: A enabling RBE, measured by favourable *business licensing & permit regulations*, would increase the performance of SMEs in African countries.

Extant literature point that developing countries have poor tax regulation and administration systems (Adegboye et al. 2018). This leads to significant non-compliance to taxation. Many businesses in developing countries view tax regulation and administration as a burden to their businesses – although this also happens in developed countries (Lee 2014) – stifling productivity to the extent that tax compliance requirements are viewed as a stumbling block for enterprises (Abrie and Doussy 2006; Adegboye et al. 2018). There is a significant negative relationship between multiple tax burdens and the performance of businesses in Nigeria, often as a result of poor tax administration, according to Adeniyi and Imade (2018). Waseem (2018) noted that firms under-reported their profits and moved some functions to the informal economy or changed their legal form when taxes were increased in Pakistan. Ironically, three years after these tax hikes, tax revenue had decreased below their initial levels.

On the other hand, Rocha et al. (2018) found that tax reduction increased formality amongst Brazilian firms. Similarly, Harju et al. (2019) noted a significant increase in the percentage of firm registrations after reducing compliance costs in Finland. Similarly, in a study of UK high growth new firms (SMEs), tax regulation is found to be the second strongest type of regulatory barrier to growth after health and safety regulations (Lee 2014). These studies show that a favourable tax administration should enhance the performance of SMEs. Thus, a second hypothesis is proposed:

H2: A enabling RBE, measured by favourable *tax administration*, would increase the performance of SMEs in African countries.

Despite the promotion of trade liberalization as a tool to spur economic growth in developing countries and studies to support its positive impact (Osakwe et al. 2018; Gnangnon 2019), there is contrary evidence to suggest that trade liberalization carries some risks and is not always beneficial to all firms in developing countries (Hunt et al. 2007; Terzİ 2010; Siddiqui 2015). For instance, while trade facilitation policies that include lower custom tariffs encourage export diversification in some developing countries (Beverelli et al. 2015; Osakwe et al. 2018), competition from foreign firms has a negative toll on the sales and capital accumulation of firms serving the domestic market in India (Bas and Ledezma 2020). Furthermore, while trade facilitation in the form of reduction of input tariffs improved the productivity of firms in Brazil (Lisboa et al. 2010), there were limited gains from trade liberalisation in the agricultural

industry to small scale farmers in some developing countries with many plagued with increased costs (Wise 2009).

In essence, trade facilitation does not impact the performance of all firms in the same way. Whereas some firms (such as large firms or export oriented firms) may experience the increased performance due to access to foreign consumers, other firms (such as SMEs linked to local markets) may experience decreased sales or performance due to the competition from foreign firms (Bas and Ledezma 2020). It is argued that even though trade facilitation offers some benefits to firms such as the reduction in production factor costs and increased access to foreign consumers, SMEs in Africa, like many developing countries, are often unable to take advantage of these benefits (due to their limited resources and capabilities) to improve their performance and that increased competition from foreign firms is detrimental to SMEs. Unlike large firms, SMEs do not have the capacity or leverage to compete against foreign firms, which adversely impacts their performance. This argument leads to the third hypothesis.

H3: A enabling RBE, measured by *trade facilitation*, would decrease the performance of SMEs in Africa countries.

Fig 5 portrays the conceptual framework for this study

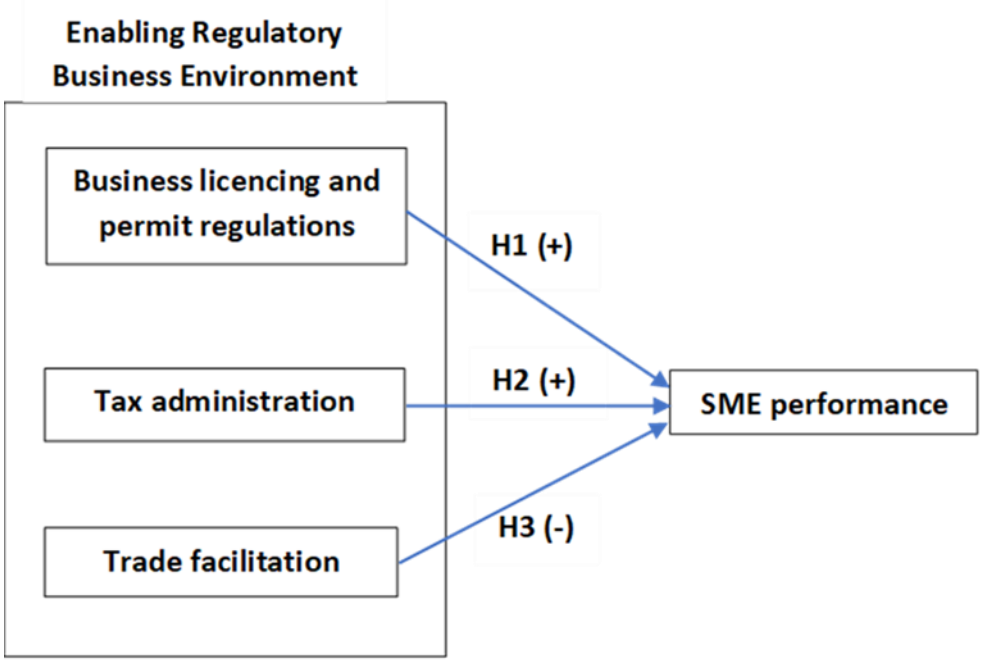


Figure 5. Conceptual framework (paper 2)

3. METHODOLOGY

3.1 Data and sample

The sample employed in this study is obtained from the World Bank Enterprise Surveys (WBES) datasets. The WBES, which began in 2002, is an extensive data repository that provides firm-level data for over 125,000 firms across 139 countries. The datasets cover over 100 indicators of the BE of firms, such as access to finance, corruption, and performance measures of firms in these countries. The WBES covers mainly firms in the manufacturing and service sectors (World Bank 2019b). There are currently 28-panel datasets on Africa available, from which 27 datasets are selected[13]. The 27-panel datasets cover surveys conducted between 2003 and 2019. The following steps are employed in obtaining the sample. Once logged in to the data section ('data by economy') of enterprisesurveys.org, this search criteria is applied: for survey type – 'enterprise survey' and 'panel data.' When this is applied, available African panel datasets come up from which panel datasets (i.e., datasets with 2 or more survey years) are selected. For instance, five datasets come up for Morocco with the search above, which are 2004–2007, 2007, 2013, 2013–2019, and 2019. Thus, only the 2004-2007, and 2013-2019 datasets are selected. These datasets are then appended to each other yielding a rich total unbalanced panel sample of 33,205 firms (*n*), and 39,461 observations (*N*). Micro firms (0-4 employees) and large firms with up to 250 employees are maintained in the sample, so it aligns with other studies and the more general definition of SMEs which is up to 250 employees – see for instance, the

[13] Ethiopia is excluded because its dataset was missing a panel id variable

European Commission definition of SMEs (European Commission 2020) (see Table 11).

The African business environment offers a very interesting setting to conduct empirical analyses for this study. According to the World Bank Doing Business report, Sub Saharan Africa (SSA) has one of the weakest business environments with an average Ease of Doing Business (EODB) score of 51.8, way below the global average score of 63.0. Moreover, it takes an average of 21.5 days to register a business in SSA compared to 11.9 in the European Union (EU) (World Bank 2020a).

Table 11. Sample description (please see Appendix 1)

Table 12. Variables (paper 2)

Variable	Definition	Obs	Mean	Std. Dev	Min	Max
Panel A: Dependent variable (firm performance)						
Revenue	The log of the total annual sales of firm[a]	35,981	12.241	2.965	6.053	20.798
Panel B: Objective independent variables (RBE proxies)						
Ease of starting a business	The RBE proxied by the DB 'ease of starting a business' score	38,457	66.498	17.299	17.4	93
Ease of paying taxes	The RBE proxied by the DB 'ease of paying taxes' score	34,069	53.270	13.827	14.9	78.6
Ease of trading across borders	The RBE proxied by the DB 'ease of trading across borders' score	30,460	44.983	17.742	1.9	82.2
Panel B: Subjective independent variables (RBE proxies)						
Business licensing & permits	The RBE proxied by how much of an obstacle business licensing & permit regulation are to a firm[b]	32,790	2.807	1.191	0	4
Customs & trade regulations	The RBE proxied by how much of an obstacle customs & trade regulation are to a firm[b]	32,370	2.834	1.253	0	4
Tax administration	The RBE proxied by how much of an obstacle tax administration is to a firm[b]	33,186	2.419	1.285	0	4
Panel C: Control variables						
Retained earnings or internally gen. funds	Finance from retained earnings or internal funds[c]	37,764	3.244	1.046	1	4
Banks (public & private)	Finance from bank financial institutions, private and state-owned[c]	33,736	1.164	0.526	1	4

Access to finance constraints	Constraints (obstacles) in accessing external finance (0= no obstacle; 1= minor obstacle; 2= moderate obstacle; 3= major obstacle; 4= very severe obstacle)	36,722	1.959	1.428	0	4
Size of firm	The size of a firm (measured by log of the number of permanent employees)	39,446	2.955	1.366	0	10.309
Age of firm	The log of the age of firm	38,411	2.480	0.872	0	5.352
Status of firm	Legal status of firm (1= Sole Proprietorship; 2= Partnership; 3= Limited Partnership; 4= Shareholding with traded shares; 5= Shareholding with non-traded shares; 6= Other)	37,721	3.034	1.005	1	6
Human capital of O/M	The human capital of the Owner/Manager (represented by the number of years of business-related experience)	38,169	14.758	10.431	0	72
Sector	The sector/industry of firm (1= Manufacturing; 2= Retail; and 3= Services)	31,911	1.821	0.884	1	3
Gross Domestic Product Per Capita	The log of the GDP per capita of the country where firm is located	39,461	7.353	0.756	5.543	8.769

Notes:

[a] Annual sales is the converted USD equivalent using appropriate exchange rates from the International Financial Statistics (IFS) of the IMF

[b] 0 = A very poor RBE; and 4 = A very good RBE

[c] 1= 0 to 25%; 2= 26 to 50%; 3= 51 to 75%; 4= 76 to 100% of working capital

3.2 Variables

Table 12 provides a description of the variables employed for this study.

3.2.1 Dependent variables

Some of the standard measures of SME performance used in literature include: revenue, growth, profit, Return on Assets (ROA), Return on Investment (ROI), Return on Equity (ROE), and Tobin's Q. Revenue is selected (that is annual sales of each firm) as the measure of performance of SMEs based on variables available in the sample and following similar studies (Fisman and Svensson 2007; Agostini et al. 2015; Otuo Serebour and Abraham 2017; Xiang and Worthington 2017).

All revenue and other monetary values in the sample are converted to equivalent US Dollar values for each observation and year using corresponding exchange rates from the International Financial Statistics (IFS) of the IMF (Bilgin et al. 2012).

3.2.2 Independent variables

The RBE is first proxied by three objectives (country level) Doing Business scores from the World Bank following similar studies (Munemo 2012; Hossian et al. 2018; Bosire 2019; Nketiah-Amponsah and Sarpong 2020). These proxies are: (1) the *ease of starting a business* score; (2) the *ease of paying taxes* score; and (3) *ease of trading across borders* score. These three scores measure the impact of specific business regulations on businesses and correspond to business licensing and permit regulation, tax administration, and trade facilitation.

The Doing Business project of the World Bank was launched in 2002 and measures the influence of business regulations on SMEs in over 190 countries and territories. There are ten main components of the overall Ease of Doing Business (EODB) score, which are: starting a business, dealing with construction permits, getting electricity, registering property, getting credit, protecting minority investors, paying taxes, trading across borders, enforcing contracts, and resolving insolvency. Two other areas (employing workers and contracting with the government) are not included in the EODB score (World Bank 2020a).

Unfortunately, different methodologies have been adopted by the World Bank in calculating the overall EODB score over the years, so it is impractical to obtain relative overall EODB scores to cover all the panel years (2003 to 2019). Furthermore, each of the ten components of the overall EODB score (aside from the *ease of starting a business* score) were calculated using at least two different methodologies since 2002. Thus, based on availability and practicality, scores based on the 2004-2020 methodology were selected to start *a business*; the 2006-2015 methodology for *ease of trading across borders*; and the 2006-2016 methodology for *ease of paying taxes*. Obviously, these selections mean only a few observations will not be allocated a score (please see Table 12).

Also employed are three subjective (firm-level) measures of the RBE that cover the perceived impact of business regulations on SMEs following similar studies (Beck et al. 2005b; Carlin et al. 2006; Commander and Svejnar 2008). Firm-level measures are

sometimes preferred over country-level measures of the BE because country-level measures cloud heterogeneity that is usually present in each country or even in regions within a country (Dollar et al. 2005; Dethier et al. 2011). Country-level measures also fail to capture how each unique firm is affected by different institutional deficiencies because firms are not impacted in the same way (Straub 2008). Thus, employed are three subjective firm-level measures of the RBE in this study. These measures are in response to the question: How much of an obstacle do any of the following business regulations pose to a firm: (1) business licencing and permits; (2) tax administration; and (3) customs and trade regulations (these three measures correspond to business licensing and permit regulation, tax administration and trade facilitation respectively). A Likert scale range of responses sought are no obstacle; minor obstacle; moderate obstacle; major obstacle; and very severe obstacle. This scale is reverted to reflect the quality of the RBE thus, 'no obstacle' = a very good BE (coded 4); 'minor obstacle' = a good BE (coded 3); 'moderate obstacle' = a moderate BE (coded 2); 'major obstacle' = a poor BE (coded 1); and 'very severe obstacle' = a very poor BE (coded 0).

3.2.3 Control variables

Included in this study are a variety of variables as controls. First are variables that represent the sourcing of finance of each firm – that is, the working capital funding from retained earnings and lending from banks. As a consequence of obstructive financial systems in developing countries, retained earnings is the most popular source of finance for SMEs (Bassetto et al. 2015; Zabri et al. 2015), and bank finance is the most accessible form of external finance available in developing countries (Beck 2007; Quaye 2014). Following Fowowe (2017), a subjective measure of how accessible external finance is to firms is also included.

Second, also included are variables that capture the firm's character and the entrepreneur (or owner) following similar studies and the available variables in the WBES sample (Ebaid 2009; Yazdanfar and Öhman 2015a). These variables are: the size of the firm, age of firm, and legal status of firm (for firm characteristics). Also included is the human capital of the entrepreneur (for entrepreneur characteristics). The size of a firm positively impacts its performance because bigger firms are able to exploit a wider set of opportunities than smaller firms (Xiang and Worthington 2015), however, smaller firms are also able to enhance their performance by introducing foreign technologies (Bilgin et al. 2012). There is also the assertion that firm performance improves with a firm's age because more essential business experience is gained by both the entrepreneur and the firm to manage the business efficiently (Coad et al. 2013). The legal form and ownership structure also influence the growth and profitability of private firms, according to Lappalainen and Niskanen (2012). Abor and Biekpe (2007) also noted that Board size and composition positively influence the profitability of Ghanaian SMEs. Furthermore, (Yuko et al. 2015) noted that an enterprise owners' education level is positively associated with access to formal credit in developing countries. Adomako et al. (2016) also suggest that financial literacy positively enhances the performance of SMEs in Ghana.

The macroeconomic environment is seen as another factor that impacts the SME performance (Simerly and Li 2000; Weill 2008). Hence, included is the Gross Domestic Product per Capita of the country where each firm is located at the time, *t*, as a country-level control (Fowowe 2017; Ipinnaiye et al. 2017; Quartey et al. 2017).

3.3 Econometric method

A few data cleaning operations were undertaken to prime the sample for analysis. These include eliminating ambiguous entries in the dataset, creating new panel ids for the pooled datasets, and recoding a few variables.

Following previous similar studies that sought to determine the performance of firms, the following baseline model is employed to explore firm performance as a function of the BE (Dethier et al. 2011; Fowowe 2017; Quartey et al. 2017).

$$Performance_{it} = \beta_0 + \beta_1\ Business\ Environment_{\ it} + \beta_2\ Controls_{\ it} + v_{it} \quad \ldots\ldots(1)$$

Where the dependent variable, *Performance*, refers to log of the annual revenue of each firm at a specific time, *t*. *Business Environment* refers to the set of objective RBE variables (the *ease of starting a business* score; the *ease of paying taxes* score; and *ease of trading across borders* score) and subjective RBE variables (business licencing and permits; tax administration; and customs and trade regulations). *Controls* refers to a set of controls that include: the firm's sourcing from retained earnings, from bank finance, access to finance, the size of firm, age of firm, legal status of firm, the human capital of owner or manager, sector of operation of firm, and the GDP per capita of the country where firm operates. *V* refers to unobserved idiosyncratic errors.

The panel regression estimator is employed first for the initial econometric analysis following similar studies (Dollar et al. 2005; Dethier et al. 2011; Fowowe 2017; Quartey et al. 2017). This method is suitable given the nature of the unbalanced panel dataset.

A possible concern with similar studies using the panel regression estimator is endogeneity, where there is the incidence of the unobserved (time-invariant) error term (or omitted variable) being correlated with the regressors, thus confounding the estimations (Cavaco et al. 2016; Wooldridge 2016; Ghosh 2017). Second, there is the concern of self-selection bias in the data collection process. To counter these problems, Propensity Score Matching (PSM) methods is employed to test for treatment effects of an enabling RBE on the performance of SMEs. PSM methods are more effective in establishing causal relationships by disentangling the influence of the treatment (in this study: enabling RBE) from other covariates that may well influence the performance of SMEs (Phillipson et al. 2019). PSM methods also allow for the reduction of selection bias which may have occurred in the data collection process (Cepeda et al. 2003).

To undertake the PSM analyses, treatment variables that correspond with the explanatory (independent) variables are needed. Thus, treatment variables are constructed from the three objective RBE variables (see Table 14). An 'obstructive' RBE (coded 0) refers to scores up to the 50th percentile in each distribution; an 'enabling' RBE refers to scores above the 50th percentile in each distribution. Furthermore, additional treatment variables are constructed from the responses of the

three subjective RBE variables as follows: an ‘obstructive’ RBE (coded 0) refers to responses from firms that considered a specific regulation as a 'major obstacle' or 'severe obstacle' to their operations; an ‘enabling’ RBE (coded 1) are responses from firms that considered a specific regulation as 'no obstacle' or 'minor obstacle' to their operations.

So, firms operating in obstructive RBEs are compared with firms operating in enabling BEs. Firms are matched by their funding from retained earnings, bank finance, access to finance, size of firm, age of firm, legal status of firm, human capital of O/M, sector of firm, and year of the survey. To ensure a firm is not matched to itself in the panel dataset, the PSM models are run using *n*. Also included is the year of survey in the matching criteria to ensure firms matched were surveyed at about the same period to avoid, for instance, a firm surveyed in 2005 being matched to a firm surveyed in 2018.

The PSM process requires the compression of the matching criteria (or covariates) to a single propensity score which is calculated as the probability of the treatment on the covariates. After obtaining propensity scores, individual firms with similar propensity scores can be compared (matched) across the control group (obstructive RBE) and the treated group (enabling RBE). Propensity scores are estimated with a logit (or probit) model, so, the logit regression is as follows:

$$Propensity\ score = \Pr\left(T_i = 1\right) = \beta_0 + \beta_1 Z_i + v_i \quad \text{.....(2)}$$

Where *T* is the binary treatment variable representing if a firm is either located in an obstructive (=0) or enabling (=1) RBE. *i* refers to each firm in the sample; *Z* refers to the set of matching criteria or covariates used in this study; *v* refers to the unobserved error.

The propensity scores, once computed, form the basis for matching firms across the control and treated groups. These matching approaches are employed to ensure consistency (Wooldridge 2010), Nearest Neighbour Matching (NN) (also called Mahalanobis Distance Matching) proposed by Abadie and Imbens (2006), Inverse Probability Weighting (IPW), and Regression Adjustment (RA). A balancing test (which ascertains if there are no significant differences between covariate means across both control and treated groups) after matching is also required (Dehejia and Wahba 2002). Once the balancing test is successful, the average treatment effect on treated (ATET) which is the mean effect of firms that are treated (or firms that are located in enabling RBEs) can be computed (Wooldridge 2010).

4. RESULTS AND DISCUSSION

4.1 Descriptive statistics

Interesting descriptive information on the nature of firms are noted. For instance, 52.64% of observations are small firms (firms with 5 – 19 employees); 28.26% are medium firms (20 – 99 employees); and 14.04%. are large firms (100+ employees).

Quite intriguing is that 53.55% of firms are Limited Partnerships in contrast to only 5.16% as Sole Proprietorships and 19.84% as ordinary Partnerships. These stats indicate an improvement in the general size and legal structure of SMEs in Africa and that some policies aimed at reducing unregistered firms are bearing fruit.

Also noteworthy is that most firms are in the manufacturing sector (49.66%) which cover industries like textiles, garment making, plastics and rubber, fabricated metal products, non-metallic products, and chemicals. Firms engaged in services (31.75%) include machinery and equipment, automobiles, and electronics. Firms engaged in retail (18.6%) cover industries like clothing, electronics, food, and household items[14]. These stats also indicate that there is an impressive shift from primary production to industrialization in Africa.

[14] The WBES sample employed in this study is based on formal registered firms.

Table 13. Descriptive statistics on objective RBE treatment variables (paper 2)

	Mean	Std. Dev.	Min	P25	Median	P75	Max	Obs. (*N*)
Ease of starting a business	66.498	17.299	17.4	57.4	73.5	80.6	93	38,457
Ease of paying taxes	53.270	13.827	14.9	43.7	53.1	60	78.6	34,069
Ease of trading across borders	44.983	17.742	1.9	36.2	42.8	59.3	82.2	30,460

Table 14. Correlations (paper 2)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	1															
2	0.1727	1														
3	-0.064	0.4025	1													
4	0.3006	0.4869	-0.049	1												
5	0.0821	0.116	0.0743	0.1093	1											
6	-0.079	0.0918	0.0175	0.0725	0.3361	1										
7	0.0651	0.0839	0.0321	0.1783	0.3549	0.3512	1									
8	-0.061	-0.125	-0.09	-0.044	0.048	0.0758	0.0674	1								
9	0.1463	0.038	0.0861	0.0917	-0.005	-0.096	-0.024	-0.432	1							
10	-0.149	-0.12	-0.12	-0.112	-0.237	-0.114	-0.234	0.0242	-0.0244	1						
11	0.4918	0.0351	0.0233	0.139	0.0218	-0.137	-0.017	-0.112	0.1879	-0.167	1					
12	0.1509	0.0981	0.087	0.0558	0.0358	-0.076	-0.05	-0.083	0.101	-0.028	0.3537	1				
13	-0.109	0.017	0.0201	0.0194	-0.044	-0.024	-0.009	0.0591	-0.0002	0.0607	-0.07	-0.002	1			
14	0.1318	0.027	0.1299	0.0066	0.004	-0.081	-0.047	-0.058	0.0911	0.0112	0.2235	0.5641	0.0359	1		
15	-0.03	0.3152	0.0588	0.1887	0.1488	0.1938	0.1521	-0.005	-0.0588	-0.091	-0.019	0.0686	-0.005	0.0011	1	
16	0.0027	0.5274	0.4529	0.2458	0.0808	0.1429	0.1674	-0.078	-0.0374	-0.139	-0.006	0.0089	-0.021	-0.028	0.0047	1

Notes: 1= Revenue; 2= Ease of starting a business; 3= Ease of trading across borders; 4= Ease of paying taxes
5= Business licensing & permits; 6= Customs & trade regulations; 7= Tax administration
8= Retained earnings; 9= Bank finance; 10= Access to finance; 11= Size of firm; 12= Age of firm; 13= Status of firm
14= Human capital of O/M; 15= Country; 16= GDP per capita

Table 15. Regression results (paper 2)

	Revenue
Ease of starting a business	0.038***
	(0.002)
Ease of paying taxes	0.034***
	(0.001)
Ease of trading across borders	-0.022***
	(0.001)
Business licensing & permits	0.114***
	(0.016)
Tax administration	0.109***
	(0.015)
Customs & trade regulations	-0.110***
	(0.016)
Retained earnings & internally gen. funds	0.078***
	(0.018)
Banks (public & private)	0.283***
	(0.040)
Access to finance	-0.096***
	(0.013)
Size of firm	1.122***
	(0.016)
Age of firm	-0.236***
	(0.026)
Status of firm	-0.288***
	(0.019)
Human capital of O/M	0.274***
	(0.027)
Country	-0.056***
	(0.003)

GDP per capita	-0.408***
	(0.030)
Constant	9.848***
	(0.234)
Wald chi2(15)	10622.91***
Observations	21,208
Number of firms	19,564

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Note: Model is Random Effects

Table 16. Probability of firm being in an enabling RBE (paper 2)

	Objective RBE			Subjective RBE		
	Ease of starting a business	Ease of paying taxes	Ease of trading across borders	Business licensing & permits	Tax administration	Customs & trade regulations
Retained earnings & internally gen. funds	-0.209***	0.888***	0.105*	0.159***	0.196***	0.104***
	(0.063)	(0.063)	(0.060)	(0.019)	(0.017)	(0.019)
Banks (public & private)	-0.559***	1.799***	0.884***	0.094***	0.155***	-0.064*
	(0.128)	(0.142)	(0.128)	(0.036)	(0.033)	(0.034)
Access to finance	-0.019	-0.242***	-0.651***	-0.409***	-0.373***	-0.263***
	(0.042)	(0.041)	(0.041)	(0.016)	(0.014)	(0.013)
Size of firm	0.254***	1.138***	0.160***	-0.034**	-0.027**	-0.260***
	(0.052)	(0.053)	(0.052)	(0.016)	(0.014)	(0.015)
Age of firm	0.120	-0.424***	-0.134	0.106***	-0.102***	-0.027
	(0.085)	(0.087)	(0.085)	(0.026)	(0.023)	(0.025)
Status of firm	-0.574***	0.411***	-0.116*	-0.033*	0.021	-0.030*
	(0.063)	(0.064)	(0.066)	(0.019)	(0.017)	(0.018)
Human capital of O/M	-0.063	0.640***	1.234***	0.004	-0.004	-0.067**
	(0.092)	(0.090)	(0.090)	(0.027)	(0.024)	(0.027)
Country	0.259***	0.194***	-0.074***	0.049***	0.061***	0.074***
	(0.011)	(0.010)	(0.010)	(0.003)	(0.003)	(0.003)
GDP per capita	8.098***	1.298***	5.062***	0.110***	0.392***	0.503***
	(0.219)	(0.090)	(0.108)	(0.024)	(0.023)	(0.024)
Year	1.137***	0.411***	1.119***	-0.029***	-0.039***	-0.073***
	(0.031)	(0.019)	(0.025)	(0.005)	(0.004)	(0.005)
Constant	-2,347.227***	-849.473***	-2,288.892***	58.118***	75.491***	144.159***
	(64.051)	(37.469)	(49.835)	(9.614)	(8.504)	(9.216)
Observations	30,138	27,446	24,065	22,099	21,646	22,893

Number of firms	26,609	24,637	21,997	19,923	19,513	20,582

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 17. ATET results of Nearest Neighbour Matching (paper 2)

	Objective RBE			Subjective RBE		
	Ease of starting a business	**Ease of paying taxes**	**Ease of trade across borders**	**Business licensing & permits**	**Tax administration**	**Customs & trade regulations**
Nearest Neighbour (3)	1.766***	1.130***	-2.062***	0.297***	0.208***	-0.234***
	(0.053)	(0.048)	(0.078)	(0.057)	(0.047)	(0.055)
Observations:						
Total raw	23,629	21,751	19,955	17,790	17,402	18,523
Total matched	22,738	17,286	13,616	28,248	23,164	30,078
Treated matched	11,369	8,643	6,808	14,124	11,582	15,039
Control matched	11,369	8,643	6,808	14,124	11,582	15,039

Notes: Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

ATET is average treatment effect on the treated

The following covariates are included in all models: retained earnings, bank finance, access to finance, size of firm, age of firm, status of firm, human capital of O/M, GDP per capita of country, and year of survey

Table 18. ATET results of Inverse Probability Weighting (paper 2)

	Objective RBE			Subjective RBE		
	Ease of starting a business	**Ease of paying taxes**	**Ease of trade across borders**	**Business licensing & permits**	**Tax administration**	**Customs & trade regulations**
ATET	1.161***	1.126***	-0.286***	0.241***	0.281***	-0.307***
	(0.085)	(0.045)	(0.062)	(0.056)	(0.046)	(0.056)
POM[a] (Enabling reg BE)	11.647***	11.884***	12.665***	11.913***	11.860***	12.153***
	(0.082)	(0.031)	(0.050)	(0.053)	(0.040)	(0.054)
Observations:						
Total raw	23,629	21,751	19,955	17,790	17,402	18,523
Total weighted	23,629	21,751	19,955	17,790	17,402	18,523
Treated weighted	11,779.8	10,904.4	10,477.3	8,929.4	8,759.2	9,220.4
Control weighted	11,849.2	10,846.6	9,477.7	8,860.6	8,642.8	9,302.6

Notes: Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

ATET is average treatment effect on the treated

The following covariates are included in all models: retained earnings, bank finance, access to finance, size of firm, age of firm, status of firm, human capital of O/M, GDP per capita of country, and year of survey

Table 19. ATET results of Regression Adjustment [a] (paper 2)

	Objective RBE			Subjective RBE		
	Ease of starting a business	**Ease of paying taxes**	**Ease of trade across borders**	**Business licensing & permits**	**Tax administration**	**Customs & trade regulations**
ATET	1.682***	1.241***	-0.103*	0.229***	0.223***	-0.330***
	(0.051)	(0.043)	(0.058)	(0.052)	(0.044)	(0.053)
POM[b] (Enabling reg BE)	11.126***	11.769***	12.482***	11.925***	11.918***	12.176***
	(0.046)	(0.027)	(0.050)	(0.049)	(0.038)	(0.050)
Observations	23,629	21,751	19,955	17,790	17,402	18,523

Notes: Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

ATET is average treatment effect on the treated

[a] Outcome model is Poisson

[b] Potential outcome mean

The following covariates are included in all models: retained earnings, bank finance, access to finance, size of firm, age of firm, status of firm, human capital of O/M, GDP per capita of country, and year of survey

4.2 Empirical results and discussion

Table 14 presents the bivariate correlation matrix for all variables. A correlation of .90 and above is considered problematic, however, there were no significant correlations between these variables. Table 16 also presents the regressions underlying PSM analyses. The balancing tests on whether there are no significant differences between covariate means across both control and treatment groups was satisfied in almost all matching estimations with differences in covariate weighted means negligible and variance ratios near 1.

The first hypothesis (H1) predicted that an enabling RBE, measured by favourable *business licensing & permit regulations*, would increase the performance of SMEs in African countries. Significant results from the panel regression estimator support this prediction (see Table 15: ease of starting a business, $\beta = 0.038$, $p<0.01$; business licensing and permit, $\beta = 0.114$, $p<0.01$). This means that holding all other factors fixed, a one-unit improvement in the RBE (proxied by the *ease of starting a business* objective measure) results in a 3.8% increase in revenue of SMEs. Also, holding all other factors fixed, a one-unit improvement in the RBE (proxied by subjective business licensing and permit conditions) results in a 11.4% increase in revenue of SMEs. Furthermore, The ATET results of all PSM methods are statistically the same with even larger coefficients (see Tables 16 - 18) and confirm the acceptance of H1.

These findings are very much in line in scholarly works that indicate that access to adequate business registration support services improves the performance of firms. For instance, Fernandes et al. (2018) noted a marked improvement in Portugal's

productivity after business entry reforms were implemented in 2005. Alfaro and Chari (2014) found an increase in the number of firms in industries with easier start-up-regulation in India. Demenet et al. (2016) noted a 20% increase (on average) in the value of firms when start-up reform was implemented in Vietnam. Hence, an enabling RBE, measured by favourable business licensing & permit regulations, increases the performance of SMEs in African countries.

The second hypothesis (H2) posited that an enabling RBE, measured by the favourable *tax administration*, would increase the performance of SMEs in African countries. There is ample support for this prediction when results from the panel regression estimator is considered (see Table 15: ease of paying taxes, $\beta = 0.034$, $p<0.01$; tax administration, $\beta = 0.109$, $p<0.01$). This means that holding all other factors fixed, a one-unit improvement in the RBE (proxied by the *ease of paying taxes* objective measure) results in a 3.4% increase in revenue of SMEs. Also, holding all other factors fixed, a one-unit improvement in the RBE (proxied by subjective tax administration conditions) results in a 10.9% increase in revenue of SMEs. The ATET results of all PSM methods are statistically the same (see Tables 16 - 18) and confirm the acceptance of H2.

These findings also fall in line with extant literature. While many businesses in developing countries view tax regulation and administration as a stumbling block stifling their productivity (Abrie and Doussy 2006; Adegboye et al. 2018), there is ample evidence to suggest favourable tax administration improves the performance of firms. For instance, Rocha et al. (2018) found that tax reduction increased formality

amongst Brazilian firms. Harju et al. (2019) also noted a significant increase in the percentage of firm registrations after reducing compliance costs in Finland. Lee (2014) found similar outcomes in the context of UK high growth SMEs that indicated tax regulations as the second most important barrier to their growth after health and safety regulations. Moreover, Esteller-Moré et al. (2020) found that tax reduction positively influences foreign direct investment (FDI) inflows to non-OECD countries. These studies are very much in consonance with the findings that an enabling RBE, measured by favourable tax administration, increases the performance of SMEs in African countries.

The third hypothesis predicted that an enabling RBE, measured by *trade facilitation*, would decrease the performance of SMEs in African countries. There is adequate support for this prediction from the results of the panel regression estimator (see Table 15: ease of trading across borders, $\beta = -0.022$, $p<0.01$; customs & trade regulations, $\beta = -0.110$, $p<0.01$). This means that holding all other factors fixed, a one-unit improvement in the RBE (proxied by the *ease of trading across borders* objective measure) results in a 2.2% decrease in revenue of SMEs. Also, holding all other factors fixed, a one-unit improvement in the RBE (proxied by subjective customs & trade regulations) results in an 11% decrease in revenue of SMEs. The ATET results of all PSM methods are statistically the same (see Tables 16 - 18) and confirm the acceptance of H3.

These findings are very interesting. For instance, while some studies indicate that trade liberalisation enhances the performance of firms in developing countries (Portugal-

Perez and Wilson 2012; Beverelli et al. 2015; Osakwe et al. 2018), there is contrary evidence to suggest that trade liberalization carries some risks and is not always beneficial to all firms in developing countries (Hunt et al. 2007; Terzİ 2010; Siddiqui 2015). It seems, therefore, that the benefits that come with increased trade liberalisation and trade across borders do not reach SMEs, at least in the context of Africa. The argument that increased competition from foreign firms (due to trade facilitation) overrides any benefits to SMEs seems plausible. Unlike large firms, SMEs do not have the capacity nor the leverage to compete against foreign firms, which adversely impacts their performance.

4.3 Robustness check

To ensure that the empirical results in this paper are reliable a robustness check is undertaken. This entailed the inclusion of an inflation variable in the empirical model following similar studies and then running the regression and PSM analyses once more (Aterido et al. 2011; Dinh et al. 2012; Fowowe 2017). The results from this robustness check are not different from the main results presented in this paper – see Appendices 2 to 6.

5. CONCLUSION AND RECOMMENDATIONS

The study set out to extend the research agenda on the BE by considering how different components of RBE impacts the performance of SMEs. Even though scholars have tackled the BE research field with respect to advanced economies (Lee 2014; McCann

and Ortega-Argilés 2016; Harju et al. 2019), and more on developing countries (Dollar et al. 2005; Escribano and Guasch 2005; Agboli and Ukaegbu 2006; Carlin et al. 2006; Commander and Svejnar 2008; Kinda 2010; Goel 2012; Ipinnaiye et al. 2017; Belas et al. 2019), there is a dearth of literature that isolates and disaggregates the regulatory dimension of the BE when considering its impact on the performance of SMEs in Africa. Thus, this paper contributes to the debate on how the institutional and RBE impact the performance of SMEs in African countries and aligns with calls from the World Bank for such studies to inform policy directions (World Bank 2020a).

Using regressions and PSM methods on the latest cross-country African panel datasets of the WBES, the findings interestingly indicate that not all dimensions of an enabling RBE enhance the performance of SMEs in African countries. It is found that, while an enabling business licensing and tax administration environment improves the performance of SMEs, an enabling trade facilitation environment impedes the performance of SMEs in developing countries. This finding is very interesting and seems to be borne from the argument that SMEs cannot compete with foreign firms when trade across borders is liberalized in African countries. In such instances, trade facilitation acts against its intended purpose of improving the performance of firms (Hunt et al. 2007; Terzİ 2010; Siddiqui 2015).

These findings should be of interest to policy makers and governments, especially in Africa. It is suggested that initiatives aimed at improving the regulatory framework in developing countries be fine-tuned, so they benefit SMEs. For instance, while the provision of adequate business licensing and registration system significantly

increases formality and improves the performance of firms (Alfaro and Chari 2014; Demenet et al. 2016; Fernandes et al. 2018), trade liberalization needs to be carefully thought through and implemented in such a way that SMEs are not disadvantaged. This does not entail a full systematic approach to SME policy promotion as in the well-defined case of the European smart specialization strategy (McCann and Ortega-Argiles, 2016) yet, but demonstrates the need to tailor regulatory interventions so as gain the desired impact.

Moreover, this study demonstrates that the institutional and RBE might be more reliable measures of the BE's impact on the operations of firms than other traditional measures such as macroeconomic indicators. For instance, by disaggregating the regulatory dimension of the BE, it is evident that institutions and the RBE have a direct impact on the productivity and financial performance of SMEs in African countries.

This study is limited by the sample of African countries used; hence, it would be insightful to conduct a similar study focused on other developing countries from other regions or on emerging economies. It would also be insightful to conduct a study that contrasts the impact of the RBE on firms in developing countries with emerging or developed countries.

6. APPENDIX

Appendix 1: Results of regressions used in estimating the control and treated POMs in Regression Adjustment Estimator

	Objective RBE					
	Ease of starting a business		Ease of paying taxes		Ease of trade across borders	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Retained earnings & internally gen. funds	-0.009***	0.022***	0.001	-0.007**	-0.003	0.006**
	(0.002)	(0.002)	(0.001)	(0.003)	(0.002)	(0.003)
Banks (public & private)	0.032***	0.045***	0.043***	0.004	0.022***	0.036***
	(0.004)	(0.004)	(0.003)	(0.005)	(0.005)	(0.005)
Access to finance	-0.016***	-0.015***	-0.004***	-0.017***	-0.024***	0.003*
	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)
Size of firm	0.094***	0.086***	0.098***	0.068***	0.095***	0.082***
	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)
Age of firm	-0.010***	-0.006**	0.010***	-0.023***	-0.026***	0.019***
	(0.002)	(0.003)	(0.002)	(0.004)	(0.003)	(0.003)
Status of firm	-0.009***	-0.003	-0.002	-0.025***	-0.035***	0.007***
	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)
Human capital of O/M	0.016***	0.034***	0.011***	0.032***	0.015***	0.016***
	(0.003)	(0.003)	(0.002)	(0.004)	(0.003)	(0.004)
GDP per capita	-0.005**	-0.119***	-0.047***	0.027***	0.023***	-0.029***
	(0.002)	(0.004)	(0.003)	(0.002)	(0.002)	(0.003)
Year	-0.015***	-0.019***	-0.006***	-0.017***	0.008***	-0.030***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Constant	32.946***	40.349***	13.516***	36.860***	-14.012***	62.476***
	(1.413)	(1.073)	(1.153)	(1.620)	(2.332)	(1.756)
Observations	23,629	23,629	21,751	21,751	19,955	19,955

Notes: Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

POM is Potential outcome mean
Model 1 = Potential outcome mean for control (Obstructive reg BE)
Model 2 = Potential outcome mean for treatment (Enabling reg BE)

Appendix 1 (cont.): Results of regressions used in estimating the control and treated POMs in Regression Adjustment Estimator

	Subjective Regulatory BE					
	Business licensing & permits		Tax administration		Customs & trade regulations	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Retained earnings & internally gen. funds	0.008**	0.003	0.007**	0.001	0.003	0.004*
	(0.003)	(0.002)	(0.003)	(0.003)	(0.004)	(0.002)
Banks (public & private)	0.032***	0.038***	0.032***	0.037***	0.026***	0.040***
	(0.006)	(0.004)	(0.005)	(0.004)	(0.006)	(0.004)
Access to finance	-0.011***	-0.015***	-0.006***	-0.017***	-0.003	-0.018***
	(0.003)	(0.001)	(0.002)	(0.002)	(0.003)	(0.001)
Size of firm	0.096***	0.090***	0.101***	0.087***	0.086***	0.091***
	(0.003)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)
Age of firm	0.003	-0.009***	-0.005	-0.007**	-0.004	-0.007***
	(0.005)	(0.003)	(0.003)	(0.003)	(0.005)	(0.003)
Status of firm	-0.004	-0.017***	-0.003	-0.023***	-0.005*	-0.023***
	(0.004)	(0.002)	(0.003)	(0.003)	(0.003)	(0.002)
Human capital of O/M	0.020***	0.023***	0.030***	0.020***	0.038***	0.018***
	(0.005)	(0.003)	(0.004)	(0.003)	(0.005)	(0.003)
GDP per capita	0.012***	0.004**	-0.005	0.008***	-0.003	0.011***
	(0.004)	(0.002)	(0.004)	(0.002)	(0.004)	(0.002)
Year	-0.006***	-0.011***	-0.008***	-0.010***	-0.010***	-0.011***
	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)
Constant	14.097***	25.032***	18.479***	22.729***	21.640***	23.437***
	(1.823)	(0.973)	(1.487)	(1.113)	(1.744)	(0.993)
Observations	17,790	17,790	17,402	17,402	18,523	18,523

Notes: Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

POM is Potential outcome mean

Model 1 = Potential outcome mean for control (Obstructive reg BE)

Model 2 = Potential outcome mean for treatment (Enabling reg BE)

Appendix 2: Robustness results - Regression

	Revenue
Ease of starting a business	0.040***
	(0.002)
Ease of paying taxes	0.036***
	(0.001)
Ease of trading across borders	-0.025***
	(0.002)
Business licensing & permits	0.109***
	(0.016)
Tax administration	0.115***
	(0.015)
Customs & trade regulations	-0.112***
	(0.016)
Retained earnings & internally gen. funds	0.079***
	(0.018)
Banks (public & private)	0.282***
	(0.041)
Access to finance	-0.094***
	(0.013)
Size of firm	1.139***
	(0.018)
Age of firm	-0.235***
	(0.026)
Status of firm	-0.308***
	(0.020)
Human capital of O/M	0.271***
	(0.027)
Country	-0.057***
	(0.003)
GDP per capita	-0.406***
	(0.030)
Inflation	-0.029***
	(0.005)
Constant	10.007***

	(0.241)
Wald chi2(15)	9178.31***
Observations	20,636
Number of firms	19,084

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Note: Model is Random Effects

Appendix 3: Robustness results - Probability of firm being in an enabling regulatory BE

	Objective Regulatory BE			Subjective Regulatory BE		
	Ease of starting a business	Ease of paying taxes	Ease of trading across borders	Business licensing & permits	Tax administration	Customs & trade regulations
Retained earnings & internally gen. funds	-0.135**	1.026***	0.050	0.159***	0.200***	0.109***
	(0.067)	(0.068)	(0.061)	(0.019)	(0.017)	(0.019)
Banks (public & private)	-0.110	2.429***	0.923***	0.098***	0.158***	-0.059*
	(0.155)	(0.154)	(0.144)	(0.038)	(0.034)	(0.036)
Access to finance	0.076*	-0.264***	-0.670***	-0.404***	-0.367***	-0.267***
	(0.046)	(0.044)	(0.040)	(0.016)	(0.014)	(0.013)
Size of firm	-0.085	1.281***	-0.039	-0.014	-0.041***	-0.254***
	(0.066)	(0.066)	(0.059)	(0.018)	(0.016)	(0.018)
Age of firm	-0.313***	-0.659***	0.009	0.107***	-0.097***	-0.022
	(0.101)	(0.095)	(0.088)	(0.026)	(0.023)	(0.026)
Status of firm	-1.106***	0.403***	-0.076	-0.037*	0.019	-0.038**
	(0.077)	(0.068)	(0.071)	(0.020)	(0.017)	(0.019)
Human capital of O/M	0.675***	0.848***	1.222***	0.005	-0.000	-0.057**
	(0.106)	(0.098)	(0.091)	(0.028)	(0.024)	(0.028)
Country	0.545***	0.247***	-0.102***	0.047***	0.060***	0.076***
	(0.015)	(0.011)	(0.011)	(0.003)	(0.003)	(0.003)
GDP per capita	11.361***	0.662***	5.790***	0.096***	0.379***	0.508***
	(0.229)	(0.093)	(0.135)	(0.025)	(0.023)	(0.024)
Inflation	1.046***	0.428***	-0.308***	-0.002	0.010***	0.017***
	(0.017)	(0.014)	(0.018)	(0.004)	(0.003)	(0.004)
Year	2.000***	0.529***	1.247***	-0.030***	-0.036***	-0.075***
	(0.030)	(0.020)	(0.025)	(0.005)	(0.004)	(0.005)
Constant	-4,117.875***	-1,088.741***	-2,550.562***	61.185***	70.335***	149.377***
	(61.706)	(39.245)	(50.225)	(10.052)	(8.793)	(9.699)
Observations	28,957	26,398	23,320	21,375	20,967	22,209
Number of firms	25,647	23,759	21,358	19,350	18,977	20,050

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix 4: Robustness results - ATET results of Nearest Neighbour Matching

	Objective Regulatory BE			Subjective Regulatory BE		
	Ease of starting a business	**Ease of paying taxes**	**Ease of trade across borders**	**Business licensing & permits**	**Tax administration**	**Customs & trade regulations**
Nearest Neighbour (3)	1.039***	1.203***	-1.579***	0.347***	0.242***	-0.177***
	(0.062)	(0.052)	(0.073)	(0.054)	(0.044)	(0.050)
Observations:						
Total raw	23,629	21,751	19,955	17,790	17,402	18,523
Total matched	22,738	17,286	13,616	28,248	23,164	30,078
Treated matched	11,369	8,643	6,808	14,124	11,582	15,039
Control matched	11,369	8,643	6,808	14,124	11,582	15,039

Notes: Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

ATET is average treatment effect on the treated

The following covariates are included in all models: retained earnings, bank finance, access to finance, size of firm, age of firm, status of firm, human capital of O/M, GDP per capita of country, inflation, and year of survey

Appendix 5: Robustness results - ATET results of Inverse Probability Weighting

	Objective Regulatory BE			Subjective Regulatory BE		
	Ease of starting a business	**Ease of paying taxes**	**Ease of trade across borders**	**Business licensing & permits**	**Tax administration**	**Customs & trade regulations**
ATET	0.285***	1.179***	-0.241***	0.252***	0.289***	-0.329***
	(0.106)	(0.044)	(0.064)	(0.055)	(0.045)	(0.057)
POM[a] (Enabling reg BE)	12.362***	11.697***	12.446***	11.777***	11.733***	12.083***
	(0.101)	(0.027)	(0.052)	(0.052)	(0.039)	(0.054)
Observations:						
Total raw	23,629	21,751	19,955	17,790	17,402	18,523
Total weighted	23,629	21,751	19,955	17,790	17,402	18,523
Treated weighted	11,779.8	10,904.4	10,477.3	8,929.4	8,759.2	9,220.4
Control weighted	11,849.2	10,846.6	9,477.7	8,860.6	8,642.8	9,302.6

Notes: Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

ATET is average treatment effect on the treated

The following covariates are included in all models: retained earnings, bank finance, access to finance, size of firm, age of firm, status of firm, human capital of O/M, GDP per capita of country, inflation, and year of survey

Appendix 6: Robustness results - ATET results of Regression Adjustment[a]

	Objective Regulatory BE			Subjective Regulatory BE		
	Ease of starting a business	**Ease of paying taxes**	**Ease of trade across borders**	**Business licensing & permits**	**Tax administration**	**Customs & trade regulations**
ATET	1.462***	1.278***	0.017	0.248***	0.235***	-0.368***
	(0.051)	(0.044)	(0.059)	(0.052)	(0.043)	(0.054)
POM[b] (Enabling reg BE)	11.185***	11.597***	12.187***	11.781***	11.787***	12.122***
	(0.045)	(0.025)	(0.049)	(0.049)	(0.037)	(0.051)
Observations	23,629	21,751	19,955	17,790	17,402	18,523

Notes: Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

ATET is average treatment effect on the treated

[a]Outcome model is Poisson

[b]Potential outcome mean

The following covariates are included in all models: retained earnings, bank finance, access to finance, size of firm, age of firm, status of firm, human capital of O/M, GDP per capita of country, inflation, and year of survey

CHAPTER FIVE - THE FINANCE – PERFORMANCE NEXUS OF SMES IN AFRICAN COUNTRIES: WHAT REALLY MATTERS?

5.1 CHAPTER OVERVIEW

This chapter presents the third of four papers that address the objectives of this PhD study. It explores the funding choices and financial performance relationship of SMEs in African countries by factoring the endogeneity of funding sources.

THE FINANCE – PERFORMANCE NEXUS OF SMES IN DEVELOPING COUNTRIES: WHAT REALLY MATTERS?

ABSTRACT

While the financing of firms has been a subject of interest both for scholars and policy makers for many years, there are mixed findings in literature on how different sources of funding impact the financial performance of firms. This study contributes to these debates by accounting for the critical (but often ignored) endogeneity of funding sources to provide a more holistic picture of the finance-performance relationship of SMEs in developing countries. Using a rich panel cross-country sample from the World Bank Enterprise Surveys (WBES) on Africa, and employing structural equation modelling (SEM), evidence is found to support the view that working capital funding from internal sources (such as owners, family and friends, and retained earnings), and trade credit results in weaker financial performance, while working capital funding from financial institutions (banking and non-banking) results in stronger financial performance for SMEs in African countries. Moreover, evidence is also found to confirm the varied impact of SMEs' past financial performance on their sources of funding. These findings should be of interest to policy makers and demonstrate the complexity associated with assessing the finance -performance relationship of firms.

Key words: SMEs; developing countries; finance; financial performance

1. INTRODUCTION

The financing of firms has been a subject of interest both for scholars and policy makers for many years. This is because a clear understanding of the sources of funding for firms in varied macroeconomic contexts provides invaluable insights on the operations of firms. It also provides a meaningful explanation of the performance heterogeneity of firms, which are essential keys to help policy makers unlock the full potential of firms. For instance, while SMEs contribute up to 70% of GDP in many countries, the International Finance Corporation (IFC) estimates that 40% of SMEs in developing countries do not have access to essential finance to operate and so rely on internal funds and finance from family and friends to keep their firms simply afloat (IFC 2017).

Interestingly, despite an extensive pool of literature that examine the finance – performance relationship of firms – see for instance Carpenter and Petersen (2002); Abor (2005); Beck et al. (2008a); Beck et al.(2008b); Mallick and Yang (2011); Bilgin et al. (2012); Kumar and Rao (2015); and Ayyagari et al.(2017) – there are mixed findings in literature on how different sources of funding impact the financial performance of firms. For instance, Forte and Tavares (2019) documented a negative relationship between long-term debt and the financial performance of manufacturing firms in Europe, while Abor (2007) documented a positive relationship between long-term debt and financial performance, and a negative relationship between short-term debt and financial performance of firms in Ghana and South Africa. Moreover, while Biglin et al.'s (2012) study on 77 developing countries noted that informal sources of

finance were detrimental to the performance of firms in developing countries, Priyadharsan (2019) found that informal sources of finance (such as from family and friends and trade credit) positively influence the performance of SMEs in Sri Lanka.

A reason for these mixed findings might be the endogeneity of funding sources, which is often unaccounted for in such studies. For instance, a firm's previous financial performance has a bearing on its current funding choices (Cassar and Holmes 2003; Abor and Biekpe 2009), thus, Vanacker and Manigart (2010) found that profitable firms opted for retained earnings over other sources of finance. Moreover, Zoppa and McMahon (2002) suggest that a growth in sales results in additional financial constraints for firms, which is often alleviated with short-term debt. Consequently, since there is a correlation between the previous financial performance of firms and their current funding sources, would accounting for these present more reliable findings on the finance-performance relationship? Moreover, since funding sources correlate with each other and sometimes serve as substitutes (Huang et al. 2011; Casey and O'Toole 2014), would empirical models that allow for these correlations present more robust findings?

In essence, it is reasoned that a coherent theory on the nature of finance and performance of SMEs in developing countries needs to be presented and that this narrative should account for the endogeneity of funding sources.

Consequently, using a rich panel cross-country sample from the World Bank Enterprise Surveys (WBES) on Africa, and employing structural equation modelling (SEM), this study stitches together related strands of theory while accounting for the

endogeneity of funding sources to provide a more holistic picture of the finance-performance relationship of SMEs in developing countries.

Therefore, this study extends the theory of financing and its impact on the financial performance of SMEs in Africa (and to a larger extent developing countries). It provides a clearer picture of the interrelationship between SME working capital funding from a variety of sources and the financial performance of SMEs in African countries. This study also demonstrates the complexity associated with assessing the finance-performance relationship of firms and the need to employ methodical approaches that account for a wider range of relationships to be assessed simultaneously.

The remainder of this paper is organised as follows: first, a review of relevant literature is conducted, followed by hypotheses. The methodology, results, discussion, and conclusions follow next in that order.

2. FUNDING CHOICES AND FINANCIAL PERFORMANCE IN DEVELOPING COUNTRIES – NEW PERSPECTIVES?

There is no shortage of literature on why SMEs make certain funding choices and how these choices lead to financial performance. Amongst such explanations are the Pecking Order Theory (POT), Trade-off Theory (TOT), Agency Cost Theory, and Market Timing Theory. The POT - often credited to Myers and Majluf (1984) - for instance, suggests that firms follow a hierarchical sequence of finance choices. First in this sequence is internal sources (such as owner's capital or retained earnings),

followed by debt and equity. In other words, most firms would turn to internal sources of finance before considering external sources of finance. This is so because investors often demand more premiums on equity due to risks associated with information asymmetry, hence, firms would consider equity as a last funding option (Kumar and Rao 2015). In tandem with the POT, SMEs prefer finance from internal sources such as from the owners' personal savings, family and friends, or retained earnings in the first instance for investment and expansion (Hussain et al. 2006; Bassetto et al. 2015; Mishra and Cooper 2017). Internal sources of funding are among the most popular sources of funding for SMEs in developing countries (Zabri et al. 2015), and many SMEs rely mainly on these sources to fund their working capital (Mallick and Yang 2011; IFC 2017; Akinkoye and Akinadewo 2018). Nevertheless, does the utilization of internal sources of funding for working capital improve the performance of SMEs in developing countries?

There is ample empirical evidence to prove that the greatest resource challenge SMEs face in African countries is limited access to external finance (Abor et al. 2014; Wang 2016; Coetzee and Buys 2017; Fowowe 2017), and limited access to finance hinders the performance of SMEs (Beck and Demirguc-Kunt 2006; Beck 2007; Kersten et al. 2017). For instance, Fowowe's (2017) study based on 30 African countries noted that limited access to finance exerted a significant negative impact on the performance of SMEs. On the other hand, since SMEs in developing countries are generally financially constrained, they are also more likely to rely on internal sources to fund their working capital due to their limited funding choices (Su and Sun 2011). Thus, funding from internal sources by SMEs may in effect reflect a lack of access to external finance. And since financial constraints lead to poor performance, then SMEs that rely mainly

on internal sources of funding would likely experience limited or poor financial performance. This argument may explain why Baloch et al. (2015) noted that the utilization of retained earnings did not influence the financial leverage of auto firms in Pakistan, and Koussis et al. (2017) noting that increased use of retained earnings decreased the overall equity value of firms in their simulations. Moreover, Biglin et al. (2012) also noted that informal sources of finance were detrimental to the performance of firms in developing countries. Interestingly, Yousef's (2019) study on the UK found that firms that employed higher levels of retained earnings for their operations were less profitable. Given, these arguments, that working capital funding from internal sources generally lead to weakened performance of SMEs, it is posited that.

H1: Working capital funding from owners or from family and friends results in weaker financial performance for SMEs in African countries.

H2: Working capital funding from retained earnings results in weaker financial performance for SMEs in African countries.

Besides relying mainly on internal funds, the single most accessible form of external finance available to SMEs in African countries is from banks. This is because financial systems in developing countries are dominated by commercial banks (Beck 2007; Quaye 2014). Banks in developing countries tend to be less exposed to SMEs (due to the opaqueness of SMEs), provide a lower share of investment loans, and charge higher fees and interest rates (Beck et al. 2008b; Quaye 2014). This often creates real obstacles in accessing finance for many SMEs in these countries (Yuko et al. 2015; Fowowe 2017; Quartey et al. 2017). Additionally, non-banking financial institutions

are often part of the shadow banking system in developing countries and provide lending to poorly financed businesses such as SMEs (Ghiţă-Mitrescu et al. 2016). Some non-banking financial institutions such as Microfinance institutions (MFIs) are helping to bridge the financing gap by adopting innovative ways to counteract obstacles faced by SMEs in accessing finance from commercial banks in Ghana (Quaye 2014). However, these still charge high fees and interests on loans granted to SMEs (Domeher 2012; Bond et al. 2015; Coetzee and Buys 2017).

Nevertheless, the relationship between debt and the financial performance of SMEs is very much inconclusive. For instance, while some scholars such as Maina and Ishmail (2014) identify debt as generally having a negative impact on the profitability of listed firms in Kenya, other scholars such Abor (2007) find that only short-term debt has a negative impact on firm performance; long-term debt has a positive impact on the performance of Ghanaian and South African firms. Moreover, some scholars such as Yazdanfar and Öhman (2015a) identify debt (trade credit, short-term debt, and long-term debt) as generally having a negative impact on the profitability of firms, while Ebaid (2009) found no impact of debt on the performance of Egyptian firms.

In any case, given that limited access to finance exerts a negative impact on the performance of SMEs in developing countries (Beck and Demirguc-Kunt 2006; Beck 2007; Fowowe 2017; Kersten et al. 2017), it is reasoned that any access to badly needed external finance (which is applied to working capital) should improve the financial performance of SMEs. For instance, Islam and Chitakunye (2019) found that adequate access to external funds improved the growth of Bangladeshi SMEs. Thus, SMEs that utilize available external finance from banks and non-bank financial

institutions to fund their working capital, should experience improved financial performance since this relieves them of financial constraints. Given these arguments, this third hypothesis is posited:

H3: Working capital funding from banking financial sources results in stronger financial performance for SMEs in African countries.

H4: Working capital funding from non-banking financial sources results in stronger financial performance for SMEs in African countries.

SMEs in Africa like many developing countries also turn to trade credit financing as a short-term alternative to bank finance when available (Ferrando and Mulier 2013). Huyghebaert (2006) posited that firms rely more on trade credit because suppliers are eager to finance 'unknown' firms than banks. Thus, trade credit is popular in developing countries and is considered a substitute to bank finance (Huang et al. 2011; Molina and Preve 2012; Casey and O'Toole 2014). However, the relationship between trade credit funding and financial performance is mixed. For instance, a negative relationship between trade credit and the financial performance of firms was noted by Deloof (2003), Gill et al. (2010), and Padachi (2006). Conversely, Mathuva (2010) found a positive relationship between accounts payable and financial performance of Kenyan listed firms. Also, Raheman et al. (2010), and Muchina and Kiano (2011) documented a positive relationship. In any case, there are limitations to the application of trade credit especially to the operations of firms. Trade credit cannot be diverted to other investments whereas finance in the form of cash can be applied to many investments (Burkart and Ellingsen 2004), thus trade credit in itself may not fully

relieve the financial constraints faced by SMEs needing cash for their operations. SMEs needing finance to fund their working capital would have little to gain if their main source of finance is from trade credit.

Moreover, the use of trade credit doesn't always come cheap, there are eventual costs that firms will need to bear (Cheng and Pike 2003). For instance, Aktas et al. (2012) argue that there are implicit costs associated with relinquishing rebates for cash payments, which may eventually affect financial performance. Moreover, Wu et al. (2012) argues that financially constrained firms that employ extensive trade credit for their operations eventually find it difficult to make timely repayments which lead to penalties, deterioration of credit ratings, and eventually weak financial performance. Furthermore, Kestens et al. (2012) reasons that suppliers often pass on default risks and associated insurance to customers through implicit interest costs on trade credit. These implicit costs increase repayments, taking away badly needed cash from a firm's working capital leading to poor financial performance. Given, these indications of financial performance limitations of employing trade credit to fund working capital, this hypothesis is proposed.

H5: Working capital funding from trade credit results in weaker financial performance for SMEs in African countries.

Fig 6 presents the conceptual framework driving this study.

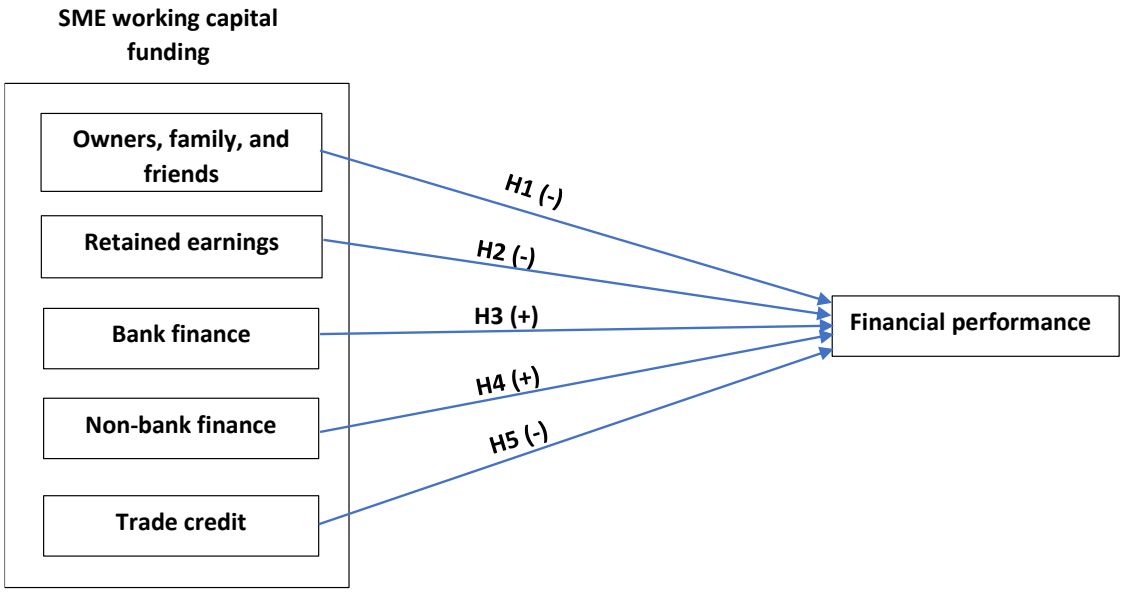


Figure 6. Conceptual framework (paper 3)

3. METHODOLOGY

3.1 Data and sample

The sample for this study is derived from the World Bank Enterprise Surveys (WBES) dataset. The WBES (which began in 2002) is an extensive data repository from the World Bank and provides firm-level data for over 125,000 firms across 139 countries. The datasets cover over 100 indicators of the business environment of firms such as access to finance, corruption, and performance measures of firms in these countries. The majority of firms covered in the WBES operate in the manufacturing and service sectors (World Bank 2019b). There are currently 28 available panel datasets based on

African countries in the WBES from which 27 datasets selected[15]. Drawing the 27 datasets together yields a rich unbalance panel sample of 39,461 firm observations (see Table 20). Micro firms (0-4 employees) and large firms with up to 250 employees are included in this study, so the sample aligns with other studies and the more general definition of SMEs which is up to 250 employees – see for instance, the European Commission definition of SMEs (European Commission 2020).

The African business environment offers a unique context for this study. For instance, the World Bank estimates that growth in Sub-Saharan Africa will fall to -3.3% in 2020 as a fallout of the COVID-19 pandemic. Consequently, the World Bank in response aims to pump 50 billion USD into African economies to support businesses, protect the poor, and bolster economic recovery (World Bank 2020d). On the other hand, the African continent has immense human and natural resources which when exploited appropriately could propel the region to a prosperous continent. In fact, it is estimated that SSA is home to the world's largest free trade area (World Bank 2020d).

[15] The dataset for Ethiopia is excluded because it was missing a panel id variable

Table 20. Sample description (please see Appendix 1)

Table 21. Variables (paper 3)

Variable	Definition	Obs (*N*)	Mean	Std. Dev	Min	Max
Panel A: Endogenous variables						
Revenue	The log of the total annual sales of firm[a]	34,077	12.024	2.902	-4.313	25.398
Family and friends	Working capital funding from owners, family, and friends[b]	33,601	1.094	0.445	1	4
Retained earnings or internally gen. funds	Working capital funding from retained earnings or internal funds[b]	35,850	3.253	1.040	1	4
Banks (public & private)	Working capital funding from bank financial institutions, private and state-owned[b]	32,237	1.156	0.513	1	4
Non-banks (micro fin., coops., etc)	Working capital funding from non-bank financial institutions which include microfinance institutions, credit cooperatives, credit unions, or finance companies[b]	34,241	1.026	0.211	1	4
Trade credit	Working capital funding from trade credit from suppliers and advances from customers[b]	35,518	1.273	0.623	1	4
Panel B: Exogenous variables						
Lagged Revenue	The log of the total annual sales of firm three years ago[a]	27,139	11.822	3.250	-6.052	27.030
Size of firm	The size of a firm (measured by log of the number of permanent employees)	37,377	2.765	1.117	0	5.521
Age of firm	The log of the age of firm	36,369	2.445	0.861	0	5.352
Status of firm	Legal status of firm (1= Sole Proprietorship; 2= Partnership; 3= Limited Partnership; 4= Shareholding with traded shares; 5= Shareholding with non-traded shares; 6= Other)	35,854	3.061	0.971	1	6
Human capital of O/M	The human capital of the Owner/Manager (represented by the log of number of years of business-related experience)	35,416	2.434	0.786	-0.693	4.277
Ease of starting a business	The regulatory BE proxied by the DB 'ease of starting a business' score	36,554	66.256	17.337	17.4	93

Ease of paying taxes	The regulatory BE proxied by the DB 'ease of paying taxes' score	32,491	53.201	13.857	14.9	78.6
Ease of trading across borders	The regulatory BE proxied by the DB 'ease of trading across borders' score	29,204	44.597	17.590	1.9	82.2
Gross Domestic Product Per Capita	The log of the GDP per capita of the country where firm is located	37,392	7.340	0.756	5.543	8.769

[a] Annual sales is the converted USD equivalent using appropriate exchange rates from the International Financial Statistics (IFS) of the IMF

[b] 1= 0 to 25%; 2= 26 to 50%; 3= 51 to 75%; 4= 76 to 100% of working capital

3.2 Variables

Table 21 provides a description of the variables employed for this study. The study employs structural equation modelling (SEM) to empirically evaluate the theoretical relationships proposed (see section 3.3 for the discussion of the empirical method).

3.2.1 Endogenous variables

Some of the standard measures of financial performance used in literature are revenue, growth, Return on Assets (ROA), Return on Investment (ROI), Return on Equity (ROE), and Tobin's Q. However, revenue is selected as the measure of financial performance in this study following similar studies and measures available in the sample (Fisman and Svensson 2007; Agostini et al. 2015; Otuo Serebour and Abraham 2017; Xiang and Worthington 2017). Revenue is proxied by the annual sales of each firm, which is the converted US Dollar equivalent value using appropriate exchange rates from the International Financial Statistics (IFS) of the IMF (Bilgin et al. 2012).

In line with the objective of considering the impact of working capital funding sources on the financial performance of SMEs and following Troilo et al. (2019), five (5) working capital funding sources are employed as independent but endogenous variables in this study. These five variables are responses to the question: What is the percentage of your working capital financed by each of these sources? These sources are: (1) family and friends, relatives; (2) retained earnings or internally generated funds; (3) banking financial institutions, private and state-owned; (4) non-banking financial institutions which include microfinance institutions, credit cooperatives, credit unions, or finance companies; and (5) trade credit from suppliers and advances

from customers. Following Quartey et al. (2017) these sources of finance variables are transformed to an ordinal scale. The transformed variables take the values 1 – 4 according to the following: 1 if a firm uses a source to finance 0-25% of working capital; 2 if a firm uses a source to finance 26-50% of working capital; 3 if a firm uses a source to finance 51-75% of working capital; and 4 if a firm uses a resource to finance 76-100% of working capital.

3.2.2 Exogenous variables

Also included in this study are a variety of exogenous variables (control variables) in each of the structural equations (described in the next section). These controls include lagged financial performance, variables to represent the business environment, firm characteristics, and entrepreneur characteristics. These variables are: for lagged performance (previous revenue from sales); for the business environment (GDP per capita, the World Bank's Doing Business *ease of starting a business* score; the *ease of paying taxes* score; and *ease of trading across borders* score); for firm characteristics (the size of the firm, age of firm, and legal status of firm); and for entrepreneur characteristics (the human capital of the entrepreneur).

The past financial performance of a firm has a bearing on current financial choices made (Cassar and Holmes 2003; Abor and Biekpe 2009). For instance, Vanacker and Manigart (2010) found that profitable firms opt for retained earnings over other sources of finance. Thus, accounting for the influence of a firm's past performance on current sourcing of funding is essential and key to the novelty of this study. The

business environment is also seen as an important factor that impacts the SME funding choices – performance relationship that is explored in this study (Simerly and Li 2000; Weill 2008). For instance, a good business environment positively improves access to finance and the performance of firms, thus improving the quality of the business environment in developing countries is a top priority for many governments (World Bank 2004, 2020a). The business environment is often measured in literature by macroeconomic indicators, institutions, political indicators, and infrastructure, amongst others (Dethier et al. 2011; Belas et al. 2019). Following similar studies (Munemo 2012; Hossian et al. 2018; Bosire 2019; Nketiah-Amponsah and Sarpong 2020), included in this study is a macroeconomic indicator (Gross Domestic Product per capita), and three indicators of institutional environment from the Doing Business scores of the World Bank - that is (1) the ease of starting a business score; (2) the ease of paying taxes score; and (3) the ease of trading across borders score.

The size of a firm is considered a major characteristic that impacts the funding choices of firms. For instance, bigger firms are associated with sourcing formal credit (Yuko et al. 2015), and smaller firms opt for short-term debt (Abor and Biekpe 2009). Moreover, bigger firms tend to perform better because they are more capable of exploiting opportunities than smaller firms (Xiang and Worthington 2015). The legal form (or status) of firms is also a determinant of the finance choices firms make. For instance, informal firms prefer informal sources of finance, whereas formal firms prefer formal sources of finance (Nkundabanyanga et al. 2014; Yuko et al. 2015; Coetzee and Buys 2017). Furthermore, the legal form of firms influences growth and profitability according to Lappalainen and Niskanen (2012). Firm age also has a

bearing on funding choices and performance of firms because more business experience is gained by the firm's owner or entrepreneur over time, which spills over to financial decisions they make and the performance of the firm (Coad et al. 2013).

The human capital of entrepreneurs also impacts the financial decisions they make. For instance, Yuko et al. (2015) noted the entrepreneur's level of education is positively associated with decisions to access formal credit in developing countries, and Adomako et al. (2016) suggested that financial literacy enhances the performance of firms.

3.3 Econometric method

SEM is the multivariate statistical technique employed in this paper. SEM is a technique that combines factor analysis, path analysis,, and multiple regression analysis amongst others, to determine the relationship between observed and unobserved variables (Kaplan 2001; Wooldridge 2010). Following similar studies (see, for instance, Baum and Locke (2004)), SEM is deemed to be an appropriate method to test the substantive theories developed in this study and to account for the endogeneity of working capital funding sources. The structural model used in this study is based on the following simultaneous equations which are derived from similar studies (Simerly and Li 2000; Abor 2005; Ebaid 2009; Yazdanfar and Öhman 2015a, 2015b).

$$Performance_{it} = \beta_0 + \beta_1\ Working\ capital\ sources\ _{it} +$$
$$\beta_2\ Lagged\ performance\ _{it} + \beta_3\ Controls\ _{it} + v_{it} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(1)$$

$$Working\ capital\ sources_{it} = \beta_0 +$$
$$\beta_1\ Lagged\ performance\ _{it} + \beta_2\ Controls\ _{it} + v_{it} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(2)$$

Where *Performance* refers to log of revenue from sales of each firm at a specific time, *t*. *Lagged performance* refers to the previous performance of a firm (in the sample this is the previous revenue from sales three years ago). *Working capital sources* refer to working capital sourcing from owners, family, and friends, retained earnings, bank finance, non-bank finance, and trade credit. *Controls* refers to the set of control variables that include the GDP per capita, the ease of starting a business score, the ease of paying taxes score, the ease of trading across borders score, the size of the firm, age of firm, legal status of firm, and the human capital of the entrepreneur. *V* refers to unobserved idiosyncratic errors.

4. RESULTS AND DISCUSSION

4.1 Descriptive statistics

There are several interesting descriptive statistics concerning the sample. For instance, 52.64% of firms in the sample are small firms (that is consisting of 5 - 19 employees), 28.26% are medium firms (20 – 99 employees), and 14.04% are large firms (100 - 250 employees). Moreover, 53.55% of firms in the sample are Limited Partnerships, 19.84% are Partnerships, and only 5.16% are Sole Proprietorships. Furthermore, 49.66% of firms in the sample are in the manufacturing sector (which include industries like plastics and rubber, textiles, garment making, and fabricated metal products), 31.75% in the service sector (which include industries like electronics, automobile, machinery, and equipment), and 18.6% in the retail sector (which include industries like food, electronics, household items and clothing). These statistics present an interesting overview of businesses in Africa and demonstrate that most firms in Africa operate in low to medium tech industries (Wintjes et al. 2014; Galindo-Rueda and Verger 2016; IMF 2018).

Additionally, it is noted that 59.71% of firms in the sample finance 76 to 100% of their working capital from retained earnings, whereas 89.42% of firms finance only up to 25% of their working capital with bank finance. Moreover, 42.49% of firms reported that access to finance was either a major or severe obstacle to their operations, compared to 22.6% reporting that access to finance was not an obstacle to their operations. These statistics are very interesting and support the view that that access to finance is still a major constraint for SMEs in African countries and so SMEs are

forced to fund their operations with internal sources (Bassetto et al. 2015; Fowowe 2017; Mishra and Cooper 2017).

Table 22. Correlations

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	1														
2	0.8404	1													
3	-0.0402	-0.0218	1												
4	-0.0861	-0.0924	-0.3282	1											
5	0.1227	0.1167	-0.4273	-0.0462	1										
6	-0.0009	-0.0195	-0.1951	-0.012	-0.0094	1									
7	0.0301	0.0368	-0.5856	-0.061	-0.0777	-0.0415	1								
8	0.4479	0.3994	-0.1067	-0.0536	0.1586	-0.0095	0.0354	1							
9	0.132	0.1438	-0.0781	-0.0216	0.0833	-0.0057	0.0348	0.2778	1						
10	-0.0799	-0.0592	0.0348	0.0041	0.0242	0.0149	-0.059	-0.0796	-0.0267	1					
11	0.0989	0.1076	-0.0503	-0.0487	0.0718	0.0197	0.0299	0.1377	0.5006	0.0285	1				
12	0.1583	0.1462	-0.1067	0.0395	0.0161	-0.0041	0.0731	0.0533	0.0855	0.0494	-0.0014	1			
13	0.3137	0.2884	-0.0431	-0.0276	0.079	0.006	0.0285	0.1138	0.0279	0.0145	-0.022	0.4849	1		
14	-0.1315	-0.0892	-0.0835	0.0494	0.0578	0.0278	-0.0058	0.012	0.1034	0.0616	0.1139	0.3627	-0.1041	1	
15	0.0145	-0.0159	-0.0724	0.0647	-0.046	-0.0164	0.0655	0.0465	0.0412	-0.0193	-0.0188	0.531	0.2161	0.4473	1

Notes: 1= Revenue; 2= Lagged revenue; 3= Retained earnings; 4: Owners, family, and friends; 5= Bank finance; 6= Non-bank finance; 7= Trade credit; 8= Size of firm; 9= Age of firm; 10= Status of firm; 11= Human capital of O/M; 12= Ease of starting a business; 13= Ease of paying taxes; 14= Ease of trading across borders; 15= GDP per capita

Table 23. Path Analysis results (paper 3)

	Paths and Corresponding Hypotheses	Predicted sign	Standardized Coefficient	Support
H1	Owners, family, and friends → Performance	-	-0.015***	Supported
H2	Retained earnings → Performance	-	-0.024***	Supported
H3	Bank finance → Performance	+	0.003	Partially Supported
H4	Non-bank finance → Performance	+	0.012***	Supported
H5	Trade credit → Performance	-	-0.025***	Supported

Notes: *** p<0.01, ** p<0.05, * p<0.1

Table 24. Additional findings (paper 3)

	Paths	Sign	Standardized Coefficient
1	Lagged performance → Owners, family, and friends	-	-0.076***
2	Lagged performance → Retained earnings	+	0.038***
3	Lagged performance → Bank finance	+	0.047***
4	Lagged performance → Non-bank finance	-	-0.023***
5	Lagged performance → Trade credit	+	0.016*
6	Lagged performance → Performance	+	0.759***

Notes: *** p<0.01, ** p<0.05, * p<0.1

4.2 Econometric results and discussion

Table 22 presents the bivariate correlation matrix for all variables employed in this study. Generally, a correlation coefficient of 0.9 and above is unacceptable and may distort the estimations. There were no significant correlations, except and as expected, revenue is correlated with lagged revenue at 0.84.

Good model fit results are noted from the SEM estimator. First, the root mean squared error of approximation (RMSEA) value is 0.0 and the pclose test is not significant (p=1), indicating a very good fit of the model. RMSEA values below 0.05 indicate a close fitting model, whereas values of up to 0.08 are fairly acceptable (Pituch and Stevens 2016). The pclose test, which considers if the model departs significantly from a close fit of the data, should not be significant to be acceptable (Schumacker and Lomax 2016).

Furthermore, it is noted that the Comparative Fit Index (CFI) is 1.0, the Tucker–Lewis index (TLI) is 1.0, and the standardized root mean squared residual (SRMR) is 0.0, all indicating a very close-fitting model. The CFI and TLI are incremental fit indicators with values 0.9 and above indicative of a close-fitting model. An SRMR value below 0.05 is considered indicative of close fit and values up to 0.1 are acceptable (Pituch and Stevens 2016). These goodness-of-fit results indicate that the model fits the data adequately.

Fig 7 and Table 23 presents a summary of the path analysis results. The first hypothesis

(H1) predicted that working capital funding from owners or family and friends results in weaker financial performance for SMEs in African countries. The path coefficient from owners, family, and friends to performance was negative and significant (b= -0.119, s.e.= 0.040, p= 0.003; β= -0.015) confirming the acceptance of H1. Moreover, the second hypothesis (H2) predicted that working capital funding from retained earnings results in weaker financial performance for SMEs in African countries. The path coefficient from retained earnings to performance was negative and significant (b= -0.070, s.e.= 0.024, p= 0.004; β= -0.024) confirming the acceptance of H2.

These results are in agreement with the arguments presented herein that SMEs in African countries are generally financially constrained (Abor et al. 2014; Fowowe 2017) and so rely on internal sources (such as from owners, family and friends) to fund their operations (Mallick and Yang 2011; Zabri et al. 2015; Akinkoye and Akinadewo 2018). However, this funding behaviour leads to poor financial gains since internal funds are likely to be inadequate leaving such firms still financially constrained. Thus, the increased utilization of internal sources of funding by SMEs in African countries is also fuelled by a lack of access to external finance besides pecking order. This finding aligns with the unusual findings of some authors that the use of retained earnings (even though cheap) did not increase the financial leverage and equity of firms (Baloch et al. 2015; Koussis et al. 2017), and supports Biglin et al.'s (2012) study that demonstrated that the use of informal sources of finance were detrimental to the performance of firms in developing countries.

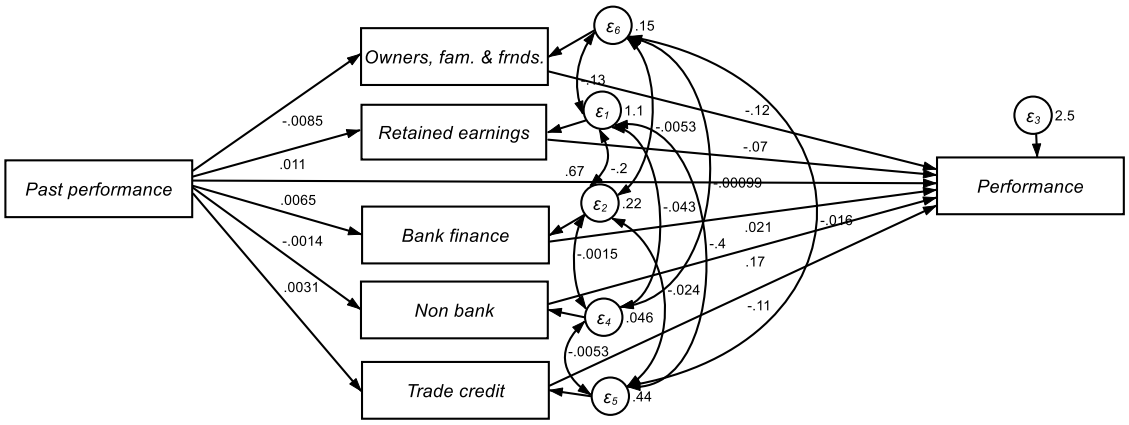


Figure 7. Structural model[16] (paper 3)

Source: Author's elaboration based on the output from STATA 15

The third hypothesis (H3) predicted working capital funding from banking financial sources results in stronger financial performance for SMEs in African countries. The path coefficient from bank finance to performance was positive but not significant (b= 0.020, s.e.= 0.036, p= 0.577; β= 0.003). Thus, H3 is only partially supported. Moreover, the fourth hypothesis (H4) predicted that working capital funding from non-banking financial sources results in stronger financial performance for SMEs in African countries. The path coefficient of non-bank finance to performance was positive and significant (b= 0.172, s.e.= 0.063, p= 0.006; β= 0.012) confirming the acceptance of H3.

[16] Controls are eliminated for clarity. The full model is supplied as Appendix 1.

This is an interesting finding that underscores the line of thought that any access to badly needed external finance should improve the financial performance of SMEs in African countries. Working capital funding with debt has a positive effect on the financial performance of SMEs in Africa since most of these firms are in any case already financially constrained. This finding agrees with studies that indicate that access to finance increases the financial performance of firms in African countries (Beck and Demirguc-Kunt 2006; Beck 2007; Kersten et al. 2017). Thus, even though commercial banks provide a lower share of investment loans to SMEs and charge higher fees and interest rates for the loans they give out (Beck et al. 2008b; Quaye 2014), SMEs still benefit by employing even limited funds from commercial banks for their working capital. Moreover, access to finance from non-bank financial institutions such as MFIs are also to some extent helpful in bridging the financing gap for SMEs (Quaye 2014).

The fifth hypothesis (H5) predicted that working capital funding from trade credit results in weaker financial performance for SMEs in African countries. The path coefficient from trade credit to bank finance was negative and significant (b= -0.113, s.e.= 0.031, p= 0.000; β= -0.024) confirming the acceptance of H5.

This is also an interesting finding that supports the argument herein that there are limitations to the application of trade credit especially to the operations of firms. Trade credit cannot be diverted to other investments (Burkart and Ellingsen 2004), thus trade credit in itself may not fully relieve the financial constraints faced by SMEs needing cash for their operations. Moreover, the use of trade credit doesn't come cheap, there are eventual costs that financially constrained firms will need to bear (Cheng and Pike

2003), such as high implicit interest costs passed on by suppliers, and penalties for untimely repayments (Kestens et al. 2012) which take away badly needed cash from a firm's working capital leading to poor financial performance. Thus, working capital funding through trade credit limits the financial performance of SMEs in Africa.

There are other additional findings worthy of discussion (see Fig 7 and Table 24). First, it is noted that there is a negative correlation between the past financial performance and working capital funding from owners, family, and friends. This finding agrees with the theory that start-ups and SMEs tend to rely exclusively on support from immediate family members since such sources of finance are often interest free and carry little or no requirements. However, with increased productivity, financial performance and growth, most SMEs would rely less on informal sources of funding, but more on formal sources of funding given their greater financial muscle (Hussain et al. 2006). Thus, financial performance (or productivity) certainly has a negative correlation with funding from owners, family, and friends.

Second, it is noted there is a positive correlation between past performance and working capital sourcing from retained earnings. This finding is very interesting and agrees with the theory that SMEs would prefer retained earnings over external funding whenever available (Zabri et al. 2015). Retained earnings are a cheaper alternative amongst the sources of funding available to SMEs in developing countries (Bassetto et al. 2015; Mishra and Cooper 2017), thus productive (and possibly profitable) SMEs would certainly allocate greater retained earnings to fund their working capital if available.

Third, it is noted that there is a positive correlation between past performance (which is simply productivity in the form of revenue in this study) and working capital funding from banking sources. This finding provides support for the claim that productive firms would utilize bank finance because retained earnings may not be enough to meet their increased financial needs. This argument is supported by Zoppa and McMahon (2002), who suggest that a growth in sales results in additional financial constraints for firms, which is often alleviated with short-term debt. Thus, firms that experience high productivity are likely to experience additional financial needs (because of increased productivity, and expenses) that cannot be alleviated by retained earnings alone. Consequently, such firms would utilize debt in addition to any retained earnings they employ.

Fourth, it is noted that there is a negative correlation between past performance and working capital sourcing from non-bank finance. This is an unexpected finding since productive firms may utilize bank finance because retained earnings may not be enough to meet their increased financial needs. However, non-banking financial institutions such as MFIs charge even higher interest rates than banking institutions in developing countries, leading to low SME patronage. Ogujiuba et al. (2013) noted that many SMEs in Nigeria do not patronise loans from MFIs due to high interest rates charged by these institutions which many SMEs cannot afford to repay. They add that some MFIs in Nigeria have even collapsed due to defaults in loan repayment and high transaction costs (Ogujiuba et al. 2013). Thus, it seems reasonable that productive SMEs in Africa will not readily opt for non-bank finance if they must source external funding, especially when funding from commercial banks is available.

Fifth, it is noted that there is a positive correlation between past performance and working capital sourcing from trade credit. This is certainly an under-researched area in literature. However, the arguments why profitable SMEs would source greater bank finance can be extended to trade credit (Zoppa and McMahon 2002). Perhaps, due to increased financial needs that cannot be met by retained earnings, such firms turn to trade credit.

Sixth, it is noted that there is a positive correlation between past performance and current performance. This final finding has support in literature. For instance, Yazdanfar and Öhman (2015a) found that the lagged sales growth of Swedish firms positively impacted current sales growth. Similarly, Baum and Locke (2004) found a positive relationship between past sales growth and current growth of firms in North America. Hence, SMEs that experience increased financial performance in the past are very likely to have increased current financial performance.

4.3 Robustness check

A further robustness check is undertaken by introducing an inflation variable to the structural model presented in this paper. This approach follows similar studies (Aterido et al. 2011; Dinh et al. 2012; Fowowe 2017). Results from this robustness check are no different from the main results presented in this paper – see Appendix 2.

5. CONCLUSION AND RECOMMENDATIONS

There are mixed findings in literature as to the influence of various sources of funding on the performance of firms. Consequently, this study set out to provide a clearer picture of the interrelationship between SME working capital funding from a variety of sources and the financial performance of SMEs in African countries by accounting for the endogeneity of funding sources. Using a rich panel cross-country sample from the World Bank Enterprise Surveys (WBES) on Africa, and employing structural equation modelling (SEM), this study provides some interesting insights.

First, evidence is found to support the view that working capital funding from internal sources (such as owners, family, and friends, and retained earnings) results in weaker financial performance for SMEs in African countries. This finding confirm that SMEs in African countries are generally financially constrained (Abor et al. 2014; Fowowe 2017) and so rely on internal sources (such as from owners, family and friends) to fund their operations (Mallick and Yang 2011; Zabri et al. 2015; Akinkoye and Akinadewo 2018). This funding behaviour, however, leads to poor financial gains since internal funds are likely to be inadequate leaving such firms still financially constrained.

Second, evidence was noted to support the view that working capital funding from financial institutions (banking and non-banking) results in stronger financial performance for SMEs in African countries. This finding underscores the line of thought that any access to badly needed external finance should improve the financial performance of SMEs in developing countries (Beck and Demirguc-Kunt 2006; Beck 2007; Kersten et al. 2017).

Third, evidence is noted to support the view that working capital funding from trade credit results in weaker financial performance for SMEs in African countries. This is so because, there are limitations to the application of trade credit especially to the operations of firms. Trade credit itself may not fully relieve the financial constraints faced by SMEs needing cash for their operations since it cannot be diverted to other investments (Burkart and Ellingsen 2004). Moreover, the use of trade credit doesn't come cheap, there are eventual costs that financially constrained firms will need to bear (Cheng and Pike 2003) which often lead to weaker financial performance.

Fourth, evidence is also found to confirm the endogenous nature of the sources of funding. For instance, it was noted that there is a negative correlation between past financial performance and working capital funding from owners, family, and friends, for SMEs. This finding supports the theory that with increased financial performance and growth, most SMEs would rely less on informal sources of funding, but more on formal sources of funding given their greater financial muscle (Hussain et al. 2006). Moreover, it was noted that there is a positive correlation between past performance and working capital sourcing from retained earnings for SMEs. This is an interesting finding and supports the view that SMEs that experience higher productivity and financial performance will rely more on retained earnings for investment in their operations since these are still cheaper compared to any form of external finance available (Zabri et al. 2015).

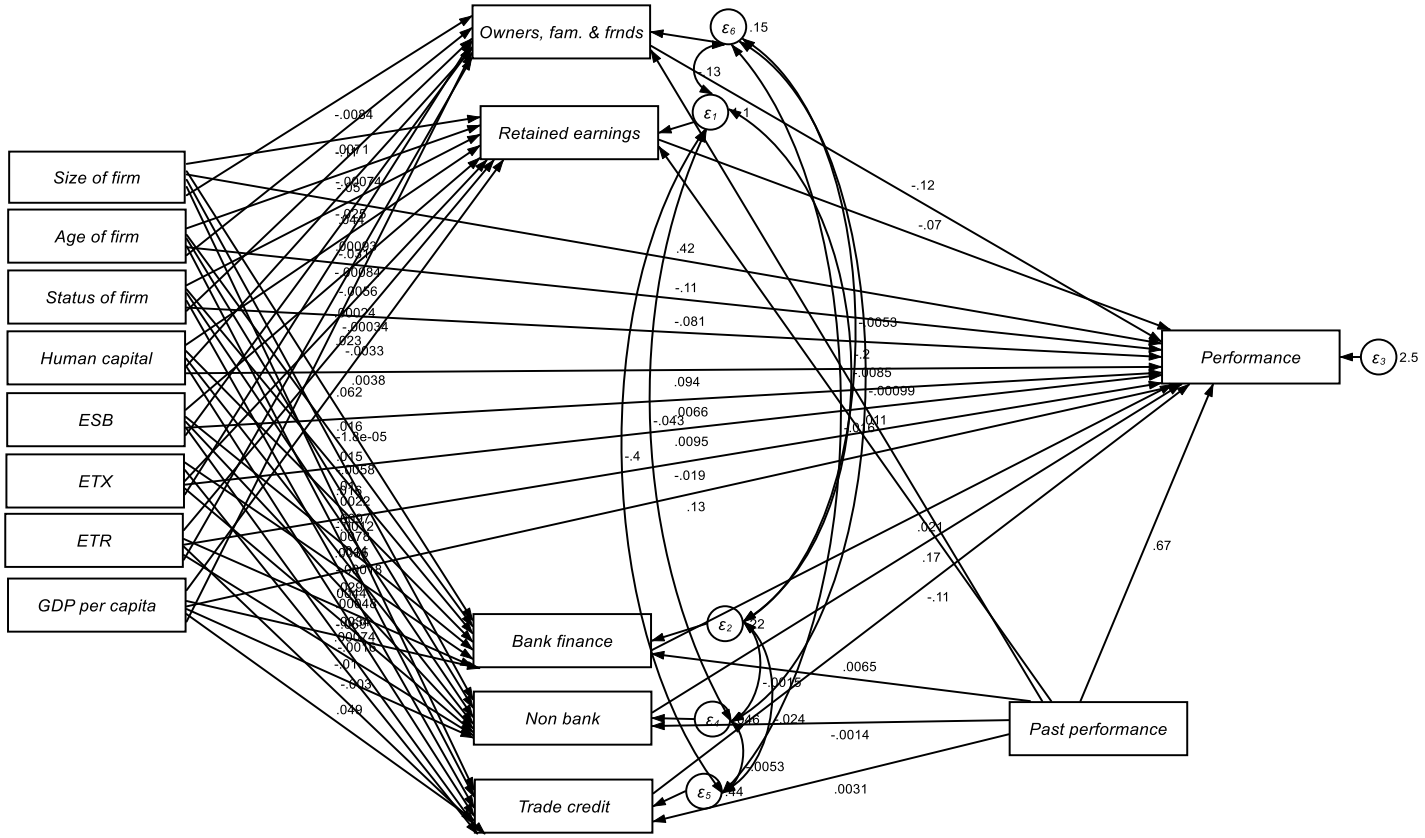
These findings should be of interest to policy makers in the sense that they confirm that SMEs still have access to finance constraints in African countries, and that these

constraints drive their financing choices in addition to pecking order behaviour. Moreover, there is clear evidence to support the view that even limited access to finance alleviates finance constraints and improves the performance of SMEs. Thus, it is suggested that continued efforts are made at making varied finance available to SMEs in developing countries. Moreover, there is abundant evidence to suggest that funding sources are endogenous, and that the previous productivity or financial performance of SMEs impact their sourcing of finance and eventual performance. This finding underscores the need to account for the endogeneity of funding sources in similar studies.

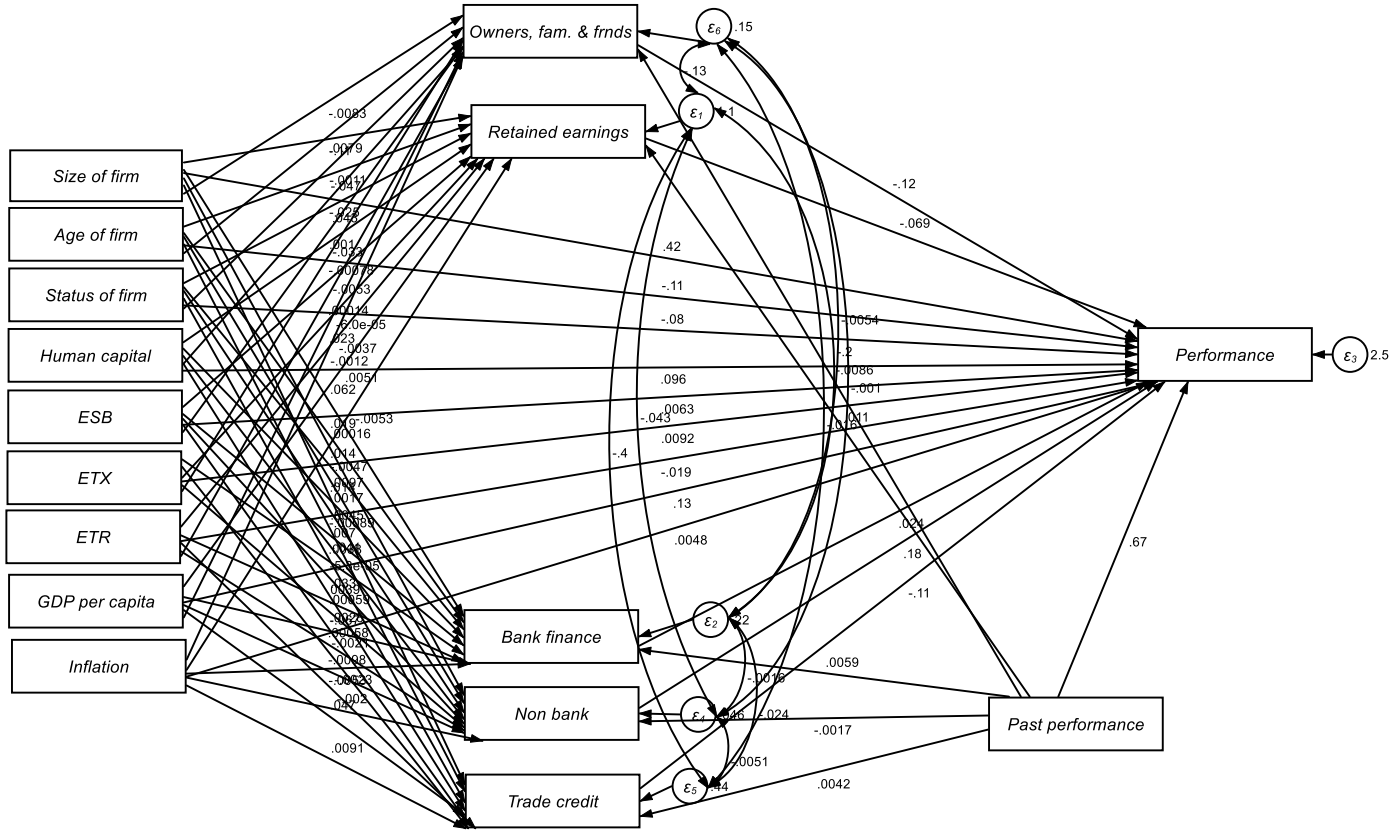
This study is limited by the sample of African countries used; hence, it would be insightful to conduct a similar study focused on other developing countries from other regions or on emerging economies. It would also be insightful to consider the findings of this study in the light of other specific sources of funding and performance measures.

6. APPENDIX

Appendix 1: Full Structural model



Appendix 2: Robustness - Full Structural model



CHAPTER SIX - BUSINESS INNOVATION MODES OF SMES IN DEVELOPING COUNTRIES – NEW EVIDENCE FROM AFRICA

6.1 CHAPTER OVERVIEW

This chapter presents the fourth of four papers that address the objectives of this PhD study. It explores how elements within the BE – institutions and innovation system – impact the innovation profiles and output of SMEs in African countries.

BUSINESS INNOVATION MODES OF SMES IN DEVELOPING COUNTRIES – NEW EVIDENCE FROM AFRICA

ABSTRACT

Numerous scholars have in recent years used the existence of innovation systems to explain differences in the adoption and potency of innovation modes in advanced countries, however, corresponding studies that explore whether regional specificities in developing countries shape the adoption and effectiveness of innovation modes are sparse but emerging in academic literature. Consequently, this study provides an essential contribution on how regional specificities in Africa impact the adoption and efficacy of business innovation modes. Using a rich African panel sample from the World Bank Enterprise Surveys (WBES) and employing Propensity Score Matching, it is noted that many SMEs in Africa are associated with DUI (innovation based on learning-by-doing, by-using, and by-interacting) drivers due to the dominance of traditional low to medium tech industries, and weak technological and absorptive capacities. However, SMEs that utilise STI (science and technology-based innovation) drivers alone or in combination with DUI drivers generate higher innovation outputs in general and greater business process (or non-technological) innovations than SMEs utilising DUI drivers alone. Furthermore, it is noted that financial constraints have a greater effect on the generation of product (technological) innovations than on business process (non-technological) innovations for SMEs in Africa. These findings imply that innovation policies need to be aligned to aid SMEs in Africa and possibly some other developing countries to fuse STI and DUI innovation activities to reap greater benefits.

Key words: STI, DUI, business innovation modes, Africa

1. INTRODUCTION

The importance of innovation to businesses in all countries cannot be overemphasised. It is a key element in making businesses gain a competitive edge (Bigliardi 2013; Pomegbe et al. 2020), improve financial performance (Aas and Pedersen 2011) and create jobs (Ciriaci et al. 2016). In fact, the World Bank identifies firm innovation as an essential key to growth and stability especially in developing countries (World Bank 2017; Cirera and Muzi 2020).

However, the question of which specific innovation drivers or modes – that is, the STI innovation mode (science and technology-based innovation) and the DUI mode (innovation based on learning-by-doing, by-using, and by-interacting) – generate the greatest appropriate innovation output in businesses is becoming increasingly important because several studies on these modes show diverging views (Jensen et al. 2007). For instance, recent studies have highlighted that in some countries, firms have generated high rates of innovation in spite of relatively small amounts of investment in R&D activities whereas in other countries, despite very high levels of investment in R&D, some firms are less successful in transforming R&D into innovation and productivity (Asheim and Parrilli 2012; Parrilli et al. 2016). Given these mixed findings, some scholars propose that innovation systems are responsible for these differences in the adoption and efficacy of innovation drivers (STI, DUI, or both) in some regions, countries, or even sectors (Cooke 2001; Asheim and Gertler 2005; Lundvall 2007). They suggest that there might be specific institutional, social, and cultural elements that impact firms within an economic area to adopt a pattern of innovation activities leading to certain outcomes. Therefore, firms co-located within a

geographic area (be it sectorial, national, or regional) may exhibit similar innovation practices and outcomes (Parrilli et al. 2016).

Consequently, several scholars have in recent years used the existence of innovation systems to explain differences in the adoption and potency of innovation modes in advanced countries – see, for instance, Isaksen and Karlsen (2010); Trippl, (2011); Isaksen and Nilsson (2013); Nunes and Lopes's (2015); Thoma, (2017); and Parrilli et al. (2020). However, corresponding studies that explore whether regional specificities in developing countries shape the adoption and effectiveness of innovation drivers are sparse but emerging in academic literature – see these recent studies on some African countries: Lukhele and Soumonni (2020), and Medase and Abdul-Basit (2020). For instance, while is well established that regional specificities such as high absorptive and technical capacities[17] define innovation systems in some regions in Europe and impact the adoption and effectiveness of innovation drivers – see, for instance Isaksen and Trippl (2017); and Parrilli et al. (2020) – very little is known about the impact of similar specificities on innovation in developing countries. Moreover, while it is known that some industries align and exploit effectively certain innovation modes – see, for instance the food industry in Trippl (2011); and Isaksen and Nilsson (2013) – very little scholarly attention has been paid to which innovation modes align with predominant industries in developing countries such as traditional low tech industries in the context of Africa (Wintjes et al. 2014; IMF 2018). Furthermore, while financial

[17] Absorptive capacity refers to a firm's ability to recognize the value of new external information, assimilate it, and apply it to commercial ends such as innovations (Cohen and Levinthal 1990; Carayannis 2012). And, technical capacity refers to the ability to transform formal scientific/ technical knowledge to viable outputs such as innovations (Isaksen and Nilsson 2013).

constraints (Beck 2007; Fowowe 2017) are prevalent in developing countries, how these constraints influence innovation profiles of SMEs in developing countries is unclear.

Accordingly, this study aims to provide insights on the innovation profiles of SMEs in developing countries – that is the innovation modes exploited (STI, DUI, or mix) by SMEs and their effectiveness in African countries. It considers the impact of three essential regional specificities in Africa – low levels of human capital and absorptive capacities, financial constraints, and the dominance of traditional low to medium tech industries – on the adoption and efficacy of innovation modes.

Using a rich African panel sample from the World Bank Enterprise Surveys and employing Propensity Score Matching, the findings in this study suggest that there are unique innovation profiles of SMEs in Africa which are driven by regional specificities. This study contributes to literature in these ways. First, it adds to the literature of regional specificities and innovation systems in Africa. Second, it contributes to the debate on which innovation modes are most effective for specific countries or regions. Third, it contributes to insights on the impact of financial constraints (which is prevalent in Africa and many developing countries) on innovation drivers and output. Fourth, it provides a better understanding of which innovation drivers policy makers in African countries could enhance to foster growth.

The remainder of this paper is structured as follows: the next section focuses on the theoretical arguments and hypotheses. The third section presents the data and empirical

methods employed in this study. The fourth section presents the results and discussion, and the last section presents the conclusions.

2. INNOVATION IN DEVELOPING COUNTRIES

2.1 Innovation modes and debates

The positive impact of innovation on the financial performance of firms has long been recognised. For instance, the seminal work of Schumpeter (1934) recognised the importance of entrepreneurship and innovation in shaping the performance of firms. Since then, numerous studies have documented the innovation- performance relationship from different dimensions – see, for instance Kleinknecht and Mohnen (2002); Nguyen et al. (2008); Bigliardi (2013); Ciriaci et al.(2016); and Expósito and Sanchis-Llopis (2019). Overall, these studies show that innovation can be a driver of economic growth, enhancing the dynamics of a firm, which in turn creates competitive advantages for firms (Nunes and Lopes 2015).

Nevertheless, two distinct innovation drivers or modes - the STI innovation mode (science and technology-based innovation) and the DUI mode (innovation based on learning-by-doing, by-using, and by-interacting) – are discussed in literature and form the basis for many debates. The STI mode is characterised by the adoption of scientific and technological activities such as investments in R&D and scientific human capital which feeds into new products, services, or processes. Thus, scientific, and technical knowledge is generated through these activities and is documented in reports and files

for onward application in innovations (Rammer et al. 2009; Fitjar and Rodríguez-Pose 2013). Firms that employ the STI mode typically invest heavily in R&D activities and are often very dependent on external sources of knowledge such as universities and research centres (Trippl 2011; Parrilli et al. 2016). This type of innovation is readily identified in industries that need a steady flow of new principles, ideas, methods, formulations, etc, to churn out new products and services for the market. The pharmaceutical and biotech industries are good examples of industries that have predominantly adopted scientific innovation activities to produce new drugs and treatments to meet market demands in the COVID-19 era.

On the other hand, the DUI mode is more practice, cooperation and experience based. New ideas are generated through doing, using, experimenting, and interacting. Consequently, new knowledge is gained through rather informal learning processes (such as on-the job experience) and the application of such insights is hardly radical but incremental as employees gradually introduce new innovations based on knew knowledge acquired. This mode is focused on problem solving and is typically associated with traditional manufacturing industries like footwear, furniture, and some engineering industries like automobile and shipbuilding (Parrilli et al. 2016). Firms that employ this mode typically rely on knowledge from on-the-job training, teamwork, bottom-up communications (within the firm), interactions with customers, suppliers, and competitors in the form of feedback (tacit knowledge) on products and services which can be used in new innovations (Thomä 2017).

The seminal work of Jensen et al. (2007) lays the foundation for much debates on the potency of either the STI, DUI, or a combination of both modes on innovation output. According to Jensen et al. (2007), there is some sort of opposition between innovation based on scientific knowledge and innovation based on experience, interaction and learning, thus, either mode is often favoured in opposition to the other. For instance, politicians and researchers often align with the science-based mode so encourage investments in R&D processes especially in high technology or science-based industries. Nevertheless, Jensen et al. (2007) demonstrated that despite this seemingly mutually exclusive adoption of innovation modes, firms that combine the STI and DUI modes generate greater product and service innovations than those relying on either mode alone. In other words, firms can reap greater rewards in innovation output when they invest simultaneously in STI and DUI innovation activities. Following Jensen et al.'s work, a number of scholars have debated this strand in innovation literature – see for instance, Chen et al. (2011); Fitjar and Rodriguez-Pose (2013); Nunes and Lopes (2015); Parrilli et al. (2016); Parrilli and Heras (2016); Lee and Miozzo (2019); Parrilli et al.(2020).

At the heart of these debates is the so-called innovation paradox proposed by Asheim and Gertler (2005), and Edquist (2005). It refers to instances where some countries and firms can generate high levels of innovation and economic growth despite limited investments in traditional R&D activities, whereas some countries and firms are unable to generate corresponding innovation output from their high R&D investments. This situation presents a paradox or contradiction because R&D expenditure is traditionally linked to high innovation output through a linear process of scientific investments leading to technological developments (Parrilli et al. 2016). An example of a country

that had a ‘negative innovation paradox’ is Sweden where high investment in R&D had not been matched by high innovation outputs; whereas a ‘positive innovation paradox’ can be noted in the successes of Denmark and Norway (Asheim and Parrilli 2012). Thus, debates on which innovation mode is adopted by countries, regions, or even firms within sectors of an economy and how these adoptions impact innovation output is warranted. This paper discusses the innovation modes adopted by SMEs (and innovation output) in the context of Africa, and the influence of financial constraints on these – which is an essential contribution to understanding SME innovation in Africa and its impact on economic growth.

2.2 Innovation systems and regional specificities

The theory of innovation systems in literature provides a plausible explanation to the existence of the innovation paradox. It refers to a network of organisations that engage in knowledge sharing and technological diffusion to promote innovation. It presumes that intense mutual interactions must be encouraged among actors in a system to turn ideas and information to innovative products or services for the market (Cooke 2001). These actors include institutional, social, and cultural elements that impact firms within an economic area to adopt a pattern of innovation activities to gain competitive advantage. Thus, firms co-located within a geographic area (be it sectorial, national, or regional) exhibit similar innovation practices and outcomes (Parrilli et al. 2016). Over the years, several scholars have contributed to theory and the nature of innovation systems at national level (Lundvall (2007); regional level (Asheim and Gertler (2005); Parrilli et al.(2020); and technological and sectorial level (Carlsson and Jacobsson (1994); Breschi and Malerba (1997). In this paper, innovation systems are mainly referred to at the regional level.

The existence of regional specificities that shape innovation systems can be seen by examining some previous works. For instance, studies based on Scandinavian and Northern European countries indicate that firms in these regions are very much capable of generating high innovation output through a combination of the STI & DUI innovation modes - see for instance Isaksen and Karlsen (2010) for Norway; Isaksen and Nilsson (2013) for Norway and Sweden; Trippl, (2011) for Austria; and Thoma, (2017) for Germany. Interestingly, a common identifier of these countries is that they rank high on human capital[18], suggesting the presence of high absorptive capacities needed to fully synthesise formal scientific/ technical knowledge with informal insights from customers, users, suppliers, competitors, and other informal sources. Other studies that provide complementary indications include Nunes and Lopes's (2015) study based on Portugal[19] which found that firms that introduced STI activities were more effective at innovations than those that rely solely on traditional DUI activities. An explanation for this finding was the presence of a workforce that has high technological capacity needed to generate knowledge from scientific activities and transform these to innovation outputs (Parrilli and Heras 2016).

Additionally, Parrilli et al.'s (2020) recent study noted that European regions with stronger technological capabilities such as north Europe and some parts of Italy and

[18] Norway scores 0.77; Sweden 0.80; Austria and Germany 0.75 on the 2020 World Bank Human Capital Index (HCI) compared to an average of 0.71 for high income countries, and a global average of 0.56. The Human Capital Index (HCI) is an 'international metric that benchmarks key components of human capital across countries' (World Bank 2020c).

[19] Portugal has a HCI of 0.77 for 2020.

the Czech republic (whom they call leaders and strong innovators) were more effective at implementing the STI mode alone, and in combining the STI and DUI modes more effectively than other regions. Their explanation for the former was that the high technological capacity of firms and employees in these regions aids in reaping benefits from science-based innovation activities. Moreover, firms in these regions have thick and diversified innovation systems that give them access to a wide range of human resources and technology - thus fully exploiting STI and DUI activities for innovations (Isaksen and Trippl 2017). In essence regional specificities (such as high human capital) define innovation systems and impact the adoption of innovation modes (and their effectiveness) in regions of Europe. But would similar regional specificities generate commensurate innovation patterns in developing countries? Providing answers underscores the novelty of this study.

2.3 Innovation systems and regional specificities in Africa

Entrepreneurship and innovation in developing African countries is quite unique. For instance, Sub Saharan Africa (SSA) has one of the poorest business environments globally according to the World Bank Doing Business report with an Ease of Doing Business (EODB) score of 51.8, far below the global average of 63.0 (World Bank 2020a). Furthermore, the World Bank emphasises that despite a unique opportunity to gain high returns from investment in innovation activities, many developing countries (such as those in Africa) are investing less in innovation than richer nations, leading to low growth rates and fewer available jobs for their ever-growing populations (World Bank 2017).

Moreover, even though having enormous economic potential, Africa has one of the lowest human capital needed to transform this potential to economic development (Mamman et al. 2018). For instance, the average score on the 2020 Human Capital Index (HCI) is 0.40 for SSA compared to the global average of 0.56, and an average of 0.71 for high income countries (World Bank 2020c). Not surprisingly, despite concerted efforts in African countries to build their human capital, many of these countries are still not self-sufficient in technological and human power development (Ogunniyi 1996). In fact some studies even suggest that the overall knowledge index in Africa has been declining since 2001 (Anyanwu 2012), which is quite worrying since Asian and Latin American countries have comparatively been making steady progress in improving their knowledge economies (Dahlman 2007; Tchamyou 2017).

Consequently, unique patterns relating to innovation activities and outcomes are expected based on the existence of low levels of human capital and low absorptive capacities in Africa. For instance, since the STI innovation mode is closely associated with regions with high technological capacities to generate knowledge from scientific activities (Isaksen and Karlsen 2010; Parrilli and Heras 2016; Thomä 2017), it is not expected that the STI innovation mode be closely associated with firms in Africa. In fact, high absorptive capacity (which is generally lacking in much of Africa) is essential for firms to adopt scientific and technological activities such as investments in R&D, and scientific human capital and to generate new scientific knowledge that can be applied to innovations (Fitjar and Rodríguez-Pose 2013). Furthermore, firms that invest in R&D activities rely heavily on external sources of knowledge such as universities and research centres (Trippl 2011; Parrilli et al. 2016), which is likely to

be unattainable for many firms in Africa. Thus, very few firms in the African region, if any, will align with STI innovation drivers.

On the other hand, it is expected that most firms in Africa are associated with DUI innovation drivers. This is anticipated because the vast majority of firms in Africa operate in traditional industries such as food and beverage production, furniture, wood products, leather products (including footwear), textiles and textile products, fashion products and accessories, ceramics, basic fabricated metal products, non-metallic mineral products, and construction products (Wintjes et al. 2014; IMF 2018). These are industries classified as medium and low-tech by the OECD due to their low R&D intensities (Galindo-Rueda and Verger 2016). Thus, it is expected that firms in Africa operating in medium and low-tech industries are associated with the DUI mode since such industries are closely related to informal generation of knowledge through doing, using, experimenting, and interactions with customers and suppliers. Firms that rely on the DUI mode often source knowledge from customers and suppliers (Jensen et al. 2007; Isaksen and Karlsen 2011). Consequently, based on (1) that the African region is characterised by weak technological and absorptive capacities, and (2) that most firms operate in traditional low to medium tech industries, a greater adoption of DUI innovation drivers over STI drivers is expected.

Nevertheless, firms that adopt only DUI drivers may be unable to generate enough innovations as firms that adopt STI drivers. This may likely be the case because STI drivers such as R&D expenditure is traditionally linked to high innovation output through a linear process of scientific investments leading to technological

developments (Parrilli et al. 2016). Moreover, firms that adopt STI drivers alone or in combination with DUI drivers are more likely to have better absorptive capacities to turn technical knowledge to innovations (Parrilli and Heras 2016). Such firms may also have innovation systems in place (for R&D) and have access to some human resources and technology needed to generate innovations (Isaksen and Trippl 2017). Thus, it is expected that firms that utilise STI drivers alone (though limited in Africa) or in combination with DUI drivers will generate greater innovations than firms that utilise DUI drivers alone.

H1: SMEs in Africa that utilise STI drivers alone are more likely to generate higher innovation outputs than SMEs utilising DUI drivers alone.

H2: SMEs in Africa that utilise both STI & DUI drivers are more likely to generate higher innovation outputs than SMEs utilising only DUI drivers.

Another theoretical nuance worthy of inclusion in this discussion is the link between innovation modes and types of innovation output. For instance, the STI innovation mode is closely associated with technological innovations because R&D and science-based activities often lead to the creation of new products and services. In other words, new scientific knowledge derived from the interactions with scientific knowledge hubs like universities and research centres (in STI activities) are often applied practically to create new technical innovations such as products or services (Parrilli and Heras 2016). For instance, firms in the pharmaceutical and Information Communication Technology (ICT) industries invest heavily in R&D to churn out new products for their

markets. Conversely, the DUI mode in which tacit knowledge plays an integral part is closely associated with non-technological innovations such as marketing and organisational innovations (Parrilli and Heras 2016; Thomä 2017). This is so because non-technological innovations require less expensive scientific inputs and knowledge and are more likely to rely on the expertise of skilled workers on what works and does not work. For instance, a shoe manufacturer would likely focus on improving its methods of production based on the experience of skilled workers who have first-hand knowledge of what is practically feasible or not. Thus, non-technological innovations are more likely to be generated from DUI activities focused on using, experimenting and learning in less formal settings (Jensen et al. 2007). Furthermore, this distinction between technological and non-technological innovations is very essential to this discussion and are referred to as 'product innovations' and 'business process innovations' respectively, in the latest version of the Oslo Manual of the European Union and the OECD (OECD/Eurostat 2018). Accordingly, product innovations are technological innovations and cover goods and services; whereas business process innovations are non-technological innovations that change the firm's business processes such as distribution and logistics, marketing, organisational and other operational innovations (OECD/Eurostat 2018).

As mentioned earlier, it is expected that most firms in Africa adopt DUI activities since these firms operate in medium to low tech industries. In fact, firms operating in medium to low tech industries often focus more on business process (non-technological) innovations (such as improving methods of production), than on product (technological) innovations. For instance, firms operating in the fashion industry may introduce new methods of making clothing and accessories based on

current trends or inputs from customers or manufacturers of equipment they employ (Jorge and Enrique 2007). Similarly, firms involved in basic metal works producing agricultural tools would likely improve their manufacturing processes based on learning by doing, experimentation and feedback from customers. Consequently, it seems plausible that SMEs in Africa would generate modest business process (non-technological) innovations than product (technological) innovations based on their predominant DUI activities. However, firms that can weave in some elements of scientific and technological activities such as investments in R&D, and scientific human capital, should produce even higher business process innovation outputs. For instance, firms operating in the fashion industry will likely improve on their existing dressmaking methods further if they invest in acquiring industry specific scientific/ technical knowledge through collaborations with research centres or perhaps government sponsored skills training centres. With an added touch of scientific or technological insights, these firms should generate far better and more efficient dressmaking methods or make improvements to other business processes such as marketing. Hence, it is argued that SMEs (operating in medium to low tech industries in Africa) that introduce scientific and technical activities in addition to their learning through doing, using, experimenting, and interacting (that is combining STI and DUI drivers), would more likely generate higher business process innovations than product innovations. Based on these arguments, this hypothesis is proposed.

H3: SMEs that adopt a combination of STI and DUI drivers in Africa will generate greater business process (non-technological) innovations than product (technological) innovations.

Another key specificity of the innovation system in developing countries are financial systems which contribute enormously to the economic fabric of all countries. There is the general consensus that financial systems in developing countries are generally weaker when compared with advanced countries (Beck 2007). For instance, financial systems in SSA (considered the least economically developed region in Africa) are dominated by commercial banks compared to more diversified financial systems in advanced countries (Beck 2007; Allen et al. 2011). Moreover, banks in developing countries like Africa tend to be less exposed to SMEs, provide a lower share of investment loans, and charge higher fees and interest rates (Beck et al. 2008b; Quaye 2014). Allen et al. (2011) noted that many banks in Africa invest in government securities (such as treasury bills) rather than lending to the private sector and firms. This often creates real obstacles in accessing finance for many SMEs (Yuko et al. 2015; Fowowe 2017; Quartey et al. 2017). Financial institutions also have varying requirements for accessing finance, thereby creating an added obstacle in accessing finance from them (Domeher 2012; Coetzee and Buys 2017). Hence, SMEs are generally denied access to finance by commercial banks and big financial institutions in developing countries (Beck 2007; Fowowe 2017; Issaka Jajah et al. 2020).

Even though the financial systems in developing countries are dominated by banks, there have been moves towards the introduction of non-banking financial institutions like microfinance institutions (MFIs) in recent years. Rateiwa and Aziakpono (2017) noted a positive correlation between the existence of non-banking financial institutions and economic growth in some African countries. Additionally, the operations of MFIs are having a positive impact on SMEs helping bridge the financing gap by adopting

innovative ways to counteract obstacles faced by SMEs in accessing finance from commercial banks (Quaye 2014).

Nevertheless, financial constraints remain a major challenge for many SMEs in developing countries (Abor et al. 2014; Wang 2016; Coetzee and Buys 2017; Fowowe 2017). Conversely, access to finance has been proven to drive innovation activities in Africa. For instance, using a sample of Nigerian SMEs, Adegboye and Iweriebo (2018) found that access to finance in the form of bank credit drives all types of firm innovation output in Nigeria. Similarly, Fombang and Adjasi (2018) noted that different sources of finance (overdraft, and trade credit) impact positively the innovation output of SMEs in selected countries in Africa. In essence, access to formal finance improves firm innovations in developing countries (Ullah 2019), whereas firms with limited access to finance are less likely to generate innovations (Mahendra et al. 2015).

Interestingly, financial constraints are particularly associated with low investment in R&D for firms. While Brown and Petersen (2009) found a strong positive correlation between equity finance and R&D for firms in the US, Ortega-Argilés et al. (2009) mentions financial constraints (in addition to weak absorptive capacity and competencies of SMEs) as delimiters of R&D investments. Hence, Brown et al. (2012) asserts that if a sufficient number of firms in a country or region are financially constrained, then R&D investment will be sufficiently depressed.

Drawing from the these insights that (1) firms in Africa are generally financially constrained, (2) financially constrained SMEs typically avoid investment in R&D (which is an STI driver), and (3) the discussions hitherto, that R&D and science-based activities often lead to the creation of new products and services, it is reasoned that financially constrained SMEs in Africa would therefore generate less product (technological) innovations since these innovations are mainly driven by STI drivers. For instance, a financially constrained shoe manufacturer may find it difficult to introduce new types of footwear because the firm cannot afford costly investment in scientific and technological activities to inform the introduction of new materials and technologies to produce new types of footwear. Similarly, a financially constrained textiles manufacturer would probably avoid investment in R&D activities for a while and concentrate on improving its current operations. Thus, based on these arguments this hypothesis is proposed:

H4: Financially constrained SMEs in Africa are more likely to generate less product (technological) innovations than financially unconstrained SMEs.

On the other hand, financially constrained SMEs operating in traditional industries (such as food and beverage production, furniture, wood products, leather products, textiles, and fashion products) should be capable of generating moderate business process (non-technological) innovations through their normal operations of doing, using, experimenting, and interactions with customers and suppliers (Jensen et al. 2007; Isaksen and Karlsen 2011) without necessarily needing additional finance to undertake additional activities. In other words, the generation of informal tacit

knowledge for business process (non-technological) innovations should be less contingent on financial capabilities. For instance, a financially constrained firm producing furniture in a low-tech industry should be capable of generating improved business or organisational processes based on its ongoing operations without necessarily needing additional finance for investment in additional innovation activities. That is not to say that financial constraints will have no effect at all on the firm's innovation outputs, but that financial constraints will have minimal effect on the generation of business process (or non-technological) innovations since these rely more on ongoing operations and less on the additional injection of finance. Given these arguments, this final hypothesis is posited:

H5: Financial constraints will have no or minimal effect on the generation of business process (non-technological) innovations for SMEs in Africa.

3. METHODOLOGY

3.1 Data and sample

The sample for this study is derived from the extensive World Bank Enterprise Surveys (WBES). The WBES is a vast data repository that provides firm-level data of over 125,000 firms across 139 countries. The WBES contains over 100 indicators on entrepreneurship (such as sourcing of finance), and the business environment (such as corruption, and the regulatory environment). The majority of firms covered by the WBES are in the manufacturing and service sectors (World Bank 2019b). A sample based on the current available African panel datasets is selected for this study. There

are currently 28 African panel datasets available from which 27 were selected[20]. These 27 panel datasets yield a rich unbalanced panel sample of 39,461 firm observations covering surveys conducted between 2003 and 2019 (see Table 25). Large firms with up to 250 employees are included in this study, so the sample aligns with other studies and the more general definition of SMEs which is up to 250 employees – see for instance the European Commission definition of SMEs (European Commission 2020).

Based on the objective of considering the regional specificity of low levels of human capital and low absorptive capacities in Africa, the World Bank Human Capital Index (HCI) is referred to as the measure of human capital and absorptive capacity in the sample (see Table 25).

Following Fowowe (2017) and Kuntchev et al. (2013), the sample is split to two groups - financially unconstrained and financially constrained firms – for some analyses. Using the WBES, Kuntchev et al. (2013) constructed 4 groups to represent the extent to which each firm was credit constrained. These 4 groups were (1) Full credit constrained (FCC); (2) Partially credit constrained (PCC); (3) Maybe credit constrained (MCC); and (4) Not credit constrained (NCC). According to Kuntchev et al. (2013), firms that fall in the FCC group applied for external credit, were rejected and currently do not have any lines of credit. This group also includes firms that did not use external sources of finance for their working capital and investments in the previous year. Essentially, these are firms that do not have access to external credit

[20] Ethiopia is excluded because its dataset was missing a panel id variable.

even though they need additional capital. Firms that fall within the PCC group used external sources of finance for their working capital and investments within the past year or had a line of credit at the time of the survey. Additionally, these firms did not apply for credit recently for reasons other than having enough capital or applied for a loan but was rejected. Firms that fall in the MCC group used external sources of finance for working capital and investment during the past year or had a current line of credit. These firms also recently applied for credit and were successful. The fourth group NCC, includes firms that did not apply for credit recently simply because they had enough capital to meet the firm's needs. Thus, these groups are constructed: (1) a financially unconstrained firms group – which is made up of the MCC and NCC groups; and (2) a financially constrained firms group – which is made up of the FCC and PCC groups of Kuntchev et al. (2013).

Table 25. Sample description (please see Appendix 1)

Table 26. Variables (paper 4)

Variable	Definition	Obs (*N*)	Mean	Std. Dev	Min	Max
Panel A: Outcome variables (firm innovation)						
Product/ Service innovation	Firm introduced new products or services in the last three years[a]	19,516	0.382	0.486	0	1
Process innovation	Firm introduced new or significantly improved process in the last three years[a]	17,551	0.265	0.441	0	1
Logistics/ distribution innovation	Firm introduced new or significantly improved logistics, delivery, or distribution methods in the last three years[a]	11,081	0.346	0.476	0	1
Organisational innovation	Firm introduced new or significantly improved organizational structures/management practices in the last three years[a]	11,081	0.342	0.474	0	1
Marketing innovation	Firm introduced new or significantly improved marketing method in the last three years[a]	11,918	0.431	0.495	0	1
Panel B: Treatment variables						
STI innovation mode	STI innovation mode proxied by firm's investment in R&D, or the use of technology licenced from another firm (0= none; 1= R&D or tech)	18,152	0.398	0.489	0	1
DUI innovation mode	DUI innovation mode proxied by firm's investment in equipment, or collaboration with clients and suppliers by email, or by the firm's website (0= none; 1= equipment or collab through email or website)	38,576	0.748	0.434	0	1
Innovation mode	Business innovation mode adopted by firm (0= none; 1= STI; 2= DUI; 3= STI & DUI)	38,890	1.669	0.989	0	3
Panel C: Control (matching) variables						
Size of firm	The size of a firm (measured by log of the number of employees)	39,446	2.955	1.366	0	10.309

Age of firm	The age of firm (measured by the log of the age of firm)	38,411	2.480	0.872	0	5.352
Sector	The sector/industry of firm (1= Manufacturing e.g., fabrication, and publishing; 2 = Retail e.g., electronics and petroleum products; and 3 = Services e.g., motor garages, and IT)	31,911	1.821	0.884	1	3
Human capital of O/M	The human capital of the Owner/Manager (represented by the log of years of business-related experience)	37,275	2.452	0.787	-0.693	4.277
Country	The country where firm is located (27 African countries in alphabetical order)	39,461	15.105	6.337	1	27
Ease of starting a business score (ESB)	The regulatory business environment proxied by the DB 'ease of starting a business' score	38,457	66.498	17.299	17.4	93

[a] 0 = No; 1 = Yes

Table 27. Descriptive stats on innovation modes (paper 4)

	Full sample			Financially unconstrained firms			Financially constrained firms		
Innovation mode	**Obs.**	**Percent**	**Cumulative**	**Obs.**	**Percent**	**Cumulative**	**Obs.**	**Percent**	**Cumulative**
None	8,771	22.55	22.55	2,577	17.77	17.77	621	12.75	12.75
STI only	1,272	3.27	25.82	484	3.34	21.1	120	2.46	15.22
DUI only	22,897	58.88	84.7	8,409	57.98	79.08	3,218	66.09	81.31
Both (STI & DUI)	5,950	15.3	100	3034	20.92	100	910	18.69	100
Total	38,890	100		14,504	100		4,869	100	

3.2 Variables

Table 26 presents the variables employed in this study.

3.2.1 Outcome variables

In line with the latest Oslo Manual's classification of product (technological) and business process (non-technological) innovations, five innovation output variables are selected as outcome variables in this study (OECD/Eurostat 2018). They are for 'product innovations', product/service innovation. And for 'business process innovations', process, distribution/logistics, organisational, and marketing innovations. These are binary variables derived from the sample and capture if a firm introduced a new or significantly improved corresponding innovation during the three years preceding the survey. For instance, the variable organisational innovation is coded one (1) if a firm introduced any new or significantly improved organizational structures/management practices in the last three years; and zero (0) if a firm did not introduce any organizational innovations (see Table 26). The selection of these innovation outcome variables follows similar studies (Trippl 2011; Fitjar and Rodríguez-Pose 2013; Parrilli et al. 2020).

3.2.2 Treatment variables

As mentioned earlier, indicators in the WBES are mainly focused on entrepreneurship and the business environment. There are, however, indicators on innovation drivers that are suitable for this study. First, the STI innovation mode, which represents

adoption of scientific and technological activities, is proxied by a firm's investment in R&D (both internal and external) within the last three years or the use of technology licenced from another firm. Thus, the constructed STI variable is coded one (1) if a firm invested in R&D or uses technology licenced from another firm, and zero (0) if none of both. As discussed hitherto, the STI mode is closely associated with scientific and technical activities of which R&D is a main component. Furthermore, firms that employ the STI mode, are often very dependent on external sources of knowledge and technology such as universities, research centres, and other businesses (Trippl 2011; Parrilli et al. 2016).

Second, the DUI mode, which represents informal learning processes (such as on the job experience) and interactions with customers, suppliers, and competitors, is proxied by three variables in the sample namely investment in equipment, collaboration (or communication) with clients and suppliers by email, and collaboration (or communication) with clients and suppliers through the firm's website. Thus, the constructed DUI variable is coded one (1) if a firm purchased any equipment for its operations within the last year, or collaborates with clients and suppliers by email, or through the firm's website. The DUI variable is coded zero (0) if none of these interactions exist. As mentioned earlier, the DUI mode is focused on the generation of informal knowledge through doing, using, experimenting, and interacting (Parrilli et al. 2016; Parrilli and Heras 2016). Doing involves the operation of equipment or the undertaking of operations within a business, thus, investment in equipment is essential for these to take place. Additionally, firms that employ the DUI mode typically rely on knowledge from interactions with customers, suppliers, and competitors in the form

of feedback (tacit knowledge) on products and services which can be used in new innovations (Thomä 2017).

Furthermore, a multiple treatment innovation mode variable is constructed following Parrilli et al.(2020) according to the following coding: zero (0) if a firm adopted neither STI or DUI innovation modes; one (1) if a firm adopted only the STI innovation mode; two (2) if a firm adopted only the DUI innovation mode; and three (3) if a firm adopted both the STI and DUI modes simultaneously.

3.2.3 Matching (control) variables

Included in this study are several matching (or control) variables that correlate with firm innovation in the empirical analysis. These variables are the size of the firm, age of firm, sector of operation of firm, human capital of the owner/manager, and country where firm operates. Robson et al. (2009) found that a variety of firm characteristics like size and exporting involvement impact innovation activity in Ghana. Similarly, Rogers (2004) and Stock et al. (2002) noted that firm size impacts firm innovation. Using WBES data from 11 SSA countries, Medase (2020) also found that age and size of firm moderate the relationship between slack and innovation performance.

Entrepreneur characteristics like education level impact firm innovation according to Robson et al. (2012), while managerial ability is positively associated with radical innovation according to Chen et al. (2015) and this association is weaker for firms with older managers or those who stay in the same role for a longer time, suggesting that

they become less able. Furthermore, using firm-level data from 27 Central and Eastern European countries, Balsmeier and Czarnitzki (2013) found that there is a positive relationship between industry-specific experience of the top manager and innovation.

The business environment of firms is also controlled for. It is proxied by the 'ease of starting a business' (ESB) score from the World Bank's Doing Business report following similar studies (Munemo 2012; Hossian et al. 2018; Bosire 2019; Nketiah-Amponsah and Sarpong 2020). The ESB is an average score of the number of official procedures required to start up and formally operate a business, the cost to complete these procedures, and the paid-in minimum capital requirement. These procedures cover the processes prospective business owners need to undertake to obtain approvals, licences, permits, and verifications from the relevant authorities. A high ESB score indicates that the business environment in a country is enabling and favourable for business activities.

3.3 Empirical method

This study employs Propensity Score Matching (PSM) method for empirical evaluation. In particular, Inverse Probability Weighting Regression Adjustment (IPWRA) following Parrilli et al. (2020). PSM methods provide more consistent estimates than standard regressions by disentangling the influence of the treatment from other covariates that may influence the outcome variable (Phillipson et al. 2019). They also allow for the reduction in selection bias which is sometimes inherent in surveys (Cepeda et al. 2003). Thus, PSM methods are very appropriate for this study

given the possibility of endogeneity of the innovation modes (STI and DUI) and the nature of other elements within innovation systems that may well impact innovation outcomes (Cooke 2001; Asheim and Gertler 2005; Parrilli et al. 2020).

The IPWRA estimator is part of a group of PSM methods that are said to be double robust. This means that only either models (treatment or outcome) need to be specified correctly for consistent estimates and there is no need for both models to be specified correctly (Hirano et al. 2003). The IPWRA also allows for the application of multi-level treatments unlike other PSM methods that allow for only two levels, making it suitable for the multi-level innovation mode treatment variable (Wooldridge 2010). In computing the average treatment effect on the treated (ATET), the IPWRA estimator first computes the propensity score of each observation in the sample, which is basically the probability of each firm adopting any level of the multi-treatment variable (none, STI only, DUI only, and both)[21]. Next, regressions are estimated using a logit model because the outcome innovation variables are binary, where the inverse propensity scores are used as weights on the matching variables and treatment dummies. Then, firms are matched within each treatment level and the ATET is computed as the difference in the weighted averages of the predicted outcomes. Consistent estimates are thus generated by the IPWRA estimator based on these steps (Wooldridge 2010; Parrilli et al. 2020).

[21] To ensure a firm is not matched to itself in the panel dataset, the PSM model is run using *n*. Moreover, the year of survey is also included in the matching criteria to ensure firms matched were surveyed at about the same period to avoid, for instance, a firm surveyed in 2005 being matched to a firm surveyed in 2018.

4. RESULTS AND DISCUSSION

4.1 Descriptive statistics

Interesting descriptive statistics concerning the sample are noted. For example, 52.64% of firms are small firms (5 -19 employees), 28.26% are medium firms (20 – 99 employees), and 14.04% are large firms (100 – 250 employees)[22]. In addition, 53.55% of firms are Limited Partnerships, 19.84% are Partnerships, and only 5.16% are Sole Proprietorships[23]. Furthermore, 49.66% of firms operate in the manufacturing sector (which represent industries like textiles, fabricated metal products, plastics and rubber, and garment making), 31.75% in the service sector (which represent industries like auto repair, hospitality, IT, and entertainment), and 18.6 in the retail sector (which represent industries like petroleum products, electronics, household items and clothing). These statistics present an interesting overview of businesses in Africa and confirm the prediction that most firms in Africa will operate in low to medium tech industries – industries with low R&D intensities (Wintjes et al. 2014; Galindo-Rueda and Verger 2016; IMF 2018).

Moreover, it is noted that the average HCI (2020) for the African countries in the sample is 0.40 (min= 0.30; max= 0.55) far below the global average of 0.56 – see Table 25. These descriptive statistics suggest that there are low levels of human capital and

[22] Large firms with up to 250 employees are included in this study, so the sample aligns with other studies and the more general definition of SMEs which is up to 250 employees – see for instance the European Commission definition of SMEs (European Commission 2020).
[23] The WBES sample employed in this study is based on formal registered SMEs.

absorptive capacity in Africa, which is expected to define innovation profiles of SMEs in Africa.

Also noteworthy from Table 27 is that most firms in the sample (58.8%) adopt only DUI innovation drivers compared to a meagre 3.27% of firms adopting only STI innovation drivers, and 15.3% adopting a combination of STI and DUI innovation drivers. These descriptive statistics reflect the argument that the African region is characterised by weak technological and absorptive capacities, and that most firms operate in traditional low to medium tech industries, consequently, a greater adoption of DUI innovation drivers over STI drivers is inevitable. In fact, these statistics are in contrast to estimates from developed countries, where for instance, Parrilli et al. (2020) noted that 11% of firms adopted DUI drivers only, another 11% adopted STI drivers only, and 26% adopted a combination of STI and DUI drivers. These differences also highlight the effect of different regional innovation systems (Cooke 2001; Asheim and Gertler 2005; Parrilli et al. 2020). Furthermore, and interestingly, financial constrains seem to have no effect on the adoption of DUI drivers, in fact there is a greater adoption rate of 66.09% for financially constrained firms over 57.98% for financially unconstrained firms. On the other hand, there is lower STI adoption rate of 2.46% for financially constrained firms over 3.34% for financially unconstrained firms. These are very interesting statistics that suggest that financial constraints lower the adoption of STI drivers but have no effect (and probably increase) the adoption of DUI drivers. Overall, there is also a reduction of the adoption of both modes by financially constrained firms.

4.2 Empirical results and discussion

Table 28 presents the bivariate correlation matrix for all variables. A correlation of .90 and above is considered problematic, however, there were no significant correlations between these variables.

Hypothesis H1 predicted that SMEs in Africa that utilise STI drivers alone are more likely to generate higher innovation outputs than SMEs utilising DUI drivers alone. This is fully supported by the positive significant ATET estimates for firms that adopt STI drivers compared to firms that adopt DUI drivers alone across all five innovation outputs (see column 4 in Tables 28 to 30. Hypothesis H2 also predicted that SMEs in Africa that utilise both STI and DUI drivers are more likely to generate higher innovation outputs than SMEs utilising only DUI drivers. This is also fully supported by the positive significant ATET estimates for firms that adopt a combination of STI and DUI drivers compared to firms that adopt DUI drivers alone across all five innovation outputs (see column 5 in Tables 28 to 30).

These are interesting and novel findings in the context of Africa and developing countries. Previous studies based on advanced countries show that firms that rely on STI drivers alone or a combination of STI & DUI drivers generate greater innovation outputs than firms that rely on either innovation modes alone (Jensen et al. 2007; Parrilli et al. 2020). The main explanation in literature for these findings in advanced countries is that these regions are blessed with high absorptive and technological capacity which aids in reaping benefits from science based innovative activities

(Isaksen and Karlsen 2010; Parrilli and Heras 2016; Thomä 2017). Moreover, firms in these regions have thick and diversified innovation systems that give them access to a wide range of human resources and technology - thus being fully capable of exploiting STI and DUI activities for innovations (Isaksen and Trippl 2017). Nevertheless, the African region is quite the opposite, characterised by weak technological and absorptive capacities, and the dominance of traditional low to medium tech industries that fuel a rather high adoption of DUI innovation drivers (Wintjes et al. 2014; IMF 2018; World Bank 2020c). Furthermore, fewer firms in Africa adopt STI drivers and fewer firms generate innovations (World Bank 2017). Nonetheless, STI drivers such as R&D expenditure are traditionally linked to higher innovation output (Ortega-Argilés et al. 2009; Parrilli et al. 2016; Park et al. 2019), thus, firms that employ STI drivers alone, or in combination with DUI drivers, even in the context of Africa, reap greater innovation outputs than those that rely solely DUI drivers. This may not seem to be farfetched, but in the absence of complex regional innovation systems (as noted in advanced countries) that sometimes present 'negative innovation paradoxes' (Asheim and Parrilli 2012), it is reasonable to expect that greater innovations would be generated by the few African firms that employ scientific and technological activities.

Hypothesis H3 predicted that SMEs that adopt a combination of STI & DUI drivers in Africa will generate greater business process (or non-technological) innovations than product (or technological) innovations. This is supported by that the ATET estimates for business process innovations (distribution/logistics, organisational, and marketing) are significantly higher than the estimates for product (product & service) innovations when STI & DUI modes are employed (see columns 3 & 5 in Table 29). The only

exception is for process innovations which has very similar or marginally lower estimates for product innovations.

These results give credence to the argument that SMEs in Africa would generate modest business process innovations mainly because they operate in traditional medium to low tech industries and adopt mainly DUI activities. However, the addition of STI activities provides a boost to the generation of business process innovations because scientific, and technical knowledge which is documented in reports and files has a direct application to innovations (Rammer et al. 2009; Fitjar and Rodríguez-Pose 2013). Thus, SMEs (operating in medium to low tech industries in Africa) that introduce STI activities to their operations are more likely to reap greater business process (non-technological) innovations than product (technological) innovations. For instance, SMEs producing footwear may find it very useful to base their manufacturing processes on verified scientific or technical knowledge gained from in-house R&D or from collaboration with technical hubs like universities and research centres. Such firms would certainly be capable of developing new and more effective and efficient methods, manufacturing processes, and perhaps marketing methods when scientific and technical knowledge is applied.

Hypothesis H4 predicted that financially constrained SMEs in Africa are more likely to generate less product (technological) innovations than financially unconstrained SMEs. This is partially supported by that the ATET estimates for product innovations is generally lower for financially constrained firms compared to estimates for financially unconstrained firms particularly when STI drivers are at play (see product

& service innovation, columns 1, 4 & 5 in Tables 29 & 30). Moreover, hypothesis H5 predicted that financial constraints will have minimal or no effect on the generation of business process (non-technological) innovations for SMEs in Africa. This is also partially supported by that the ATET estimates for business process innovations (for financially constrained firms) is generally higher or similar to the estimates for financially unconstrained (see process, distribution/ logistics, organisational and marketing innovation in Tables 29 & 30).

Access to finance remains a major challenge for SMEs in Africa, making many SMEs financially constrained (Abor et al. 2014; Wang 2016; Coetzee and Buys 2017; Fowowe 2017). Interestingly, financing constraints are associated with low investment in R&D (STI drivers) for firms because R&D activities typically consume substantial financial resources, thus, Brown et al. (2012) asserts that if a sufficient number of firms in a country or region are financially constrained, then R&D investment will be sufficiently depressed. Furthermore, STI drivers are mainly associated with product innovations (Jensen et al. 2007; Parrilli and Heras 2016) making them more prone to the effects of financial constraints. Thus, financially constrained SMEs in Africa generate lower product innovations. On the other hand, business process innovations are less prone to financial constraints because their main drivers DUI activities – which are mainly the generation of informal tacit knowledge – rely less on the supply of finance and more on ongoing operations (Jensen et al. 2007; Isaksen and Karlsen 2011). So, for instance, a financially constrained firm producing furniture in a low-tech industry would be capable of generating improved business or organisational processes based on their ongoing operations (doing, using, and interacting) without necessarily needing additional finance for investment in innovation activities. This is

a very interesting finding which indicates that financial constraints have limited effect on business process (non-technological) innovations as far as the main operations of a firm is not adversely affected. In fact, these results even point to marginal increases in the generation of business process innovations when SMEs are financially constrained. These marginal increases back the claim that business process innovations should be less prone to financial constraints since their main drivers are DUI activities which can be undertaken without the need for additional investment in innovation activities.

Table 28. Correlations (paper 4)

	1	2	3	4	5	6	7	8	9	10	11	12	13
1	1												
2	0.4408	1											
3	0.4781	0.51	1										
4	0.4482	0.588	0.5735	1									
5	0.4678	0.5485	0.5418	0.5273	1								
6	0.4172	0.4417	0.4288	0.4373	0.459	1							
7	0.2029	0.2013	0.177	0.2455	0.2053	0.2247	1						
8	0.0599	0.0842	0.0225	0.1032	0.0432	0.1459	0.3223	1					
9	0.0479	0.0399	0.0212	0.071	0.0218	0.0659	0.0981	0.2548	1				
10	-0.0102	0.0637	0.0364	0.0529	0.0369	-0.001	0.0482	-0.1406	-0.0592	1			
11	-0.0379	-0.0652	-0.0781	-0.0553	-0.0828	-0.0275	0.0888	0.2148	0.4541	-0.097	1		
12	0.211	0.193	0.2215	0.1799	0.2081	0.196	-0.0497	-0.1574	-0.0147	0.0811	-0.1906	1	
13	-0.1555	-0.146	-0.1185	-0.1155	-0.1406	-0.1037	0.0346	0.1198	0.0843	-0.0619	0.1344	-0.1012	1

Notes: 1= Product/Serv innov.; 2= Process innov.; 3= Logistic/distr innov.; 4= Organisational innov.; 5= Marketing innov.; 6= STI drivers; 7= DUI drivers; 8= Size of firm; 9= Age of firm; 10= Sector of firm; 11= Human capital of O/M; 12= Country; 13= Ease of starting a business

Table 29. ATET results for full sample (paper 4)

	STI vs None	DUI vs None	Both vs None	STI vs DUI	Both vs DUI	Both vs STI	Obs. [a]
Product & Service innovation	0.329***	0.134***	0.447***	0.205***	0.332***	0.127***	13,193
	(0.019)	(0.013)	(0.014)	(0.022)	(0.016)	(0.025)	
	[0.290, 0.367]	[0.109, 0.158]	[0.420, 0.475]	[0.161, 0.248]	[0.300 0.363]	[0.079, 0.175]	
Process innovation	0.325***	0.066***	0.446***	0.209***	0.320***	0.111***	11,670
	(0.019)	(0.012)	(0.014)	(0.020)	(0.017)	(0.024)	
	[0.287, 0.363]	[0.042, 0.089]	[0.418, 0.474]	[0.169, 0.249]	[0.287, 0.352]	[0.063, 0.158]	
Distribution/ logistics innovation	0.364***	0.125***	0.496***	0.229***	0.374***	0.145***	8,042
	(0.021)	(0.016)	(0.016)	(0.024)	(0.018)	(0.026)	
	[0.323, 0.405]	[0.093, 0.156]	[0.465, 0.528]	[0.182, 0.275]	[0.339, 0.408]	[0.095, 0.195]	
Organisational innovation	0.282***	0.129***	0.498***	0.157***	0.396***	0.238***	8,042
	(0.021)	(0.015)	(0.016)	(0.024)	(0.017)	(0.026)	
	[0.242, 0.322]	[0.099, 0.159]	[0.466, 0.530]	[0.111, 0.203]	[0.362, 0.430]	[0.188, 0.288]	
Marketing innovation	0.391***	0.150***	0.552***	0.250***	0.428***	0.178***	8,732
	(0.021)	(0.016)	(0.015)	(0.024)	(0.016)	(0.025)	
	[0.350, 0.432]	[0.117, 0.182]	[0.523, 0.582]	[0.203, 0.297]	[0.397, 0.460]	[0.130, 0.227]	

Notes: Standard errors in parentheses: 95% confidence intervals in square brackets

*** p<0.01, ** p<0.05, * p<0.1

ATET is average treatment effect on the treated

[a] Raw observations

For brevity, matched (control and treated) observations are not shown

Table 30. ATET results for financially unconstrained firms (paper 4)

	STI vs None	DUI vs None	Both vs None	STI vs DUI	Both vs DUI	Both vs STI	Obs. [b]
Product & Service innovation	0.364***	0.149***	0.482***	0.221***	0.357***	0.136***	6,736
	(0.030)	(0.019)	(0.021)	(0.035)	(0.022)	(0.038)	
	[0.304, 0.424]	[0.112, 0.187]	[0.440, 0.523]	[0.153, 0.290]	[0.313, 0.400]	[0.061, 0.210]	
Process innovation	0.297***	0.040*	0.421***	0.191***	0.316***	0.124***	5,949
	(0.031)	(0.021)	(0.023)	(0.033)	(0.024)	(0.038)	
	[0.236, 0.358]	[-0.001 .0804]	[0.377, 0.466]	[0.126, 0.256]	[0.269, 0.363]	[0.049, 0.200]	
Distribution/ logistics innovation	0.366***	0.121***	0.483***	0.242***	0.365***	0.123***	4,149
	(0.033)	(0.024)	(0.024)	(0.036)	(0.025)	(0.039)	
	[0.301, 0.432]	[0.074, 0.168]	[0.436, 0.530]	[0.171, 0.313]	[0.317, 0.414]	[0.046, 0.200]	
Organisational innovation	0.242***	0.104***	0.464***	0.148***	0.378***	0.230***	4,149
	(0.033)	(0.025)	(0.025)	(0.036)	(0.025)	(0.039)	
	[0.177, 0.307]	[0.055, 0.152]	[0.415, 0 .514]	[0.077, 0.220]	[0.329, 0.427]	[0.153, 0.307]	
Marketing innovation	0.406***	0.115***	0.545***	0.294***	0.455***	0.162***	4,393
	(0.033)	(0.024)	(0.023)	(0.036)	(0.023)	(0.037)	
	[0.341, 0.470]	[0.0684, 0.162]	[0.500, 0.590]	[0.222, 0.365]	[0.411, 0.500]	[0.088, 0.235]	

Notes: Standard errors in parentheses: 95% confidence intervals in square brackets

*** p<0.01, ** p<0.05, * p<0.1

ATET is average treatment effect on the treated

[a] Raw observations

For brevity, matched (control and treated) observations are not shown

Table 31. ATET results for financially constrained firms (paper 4)

	STI vs None	DUI vs None	Both vs None	STI vs DUI	Both vs DUI	Both vs STI	Obs. [b]
Product & Service innovation	0.329***	0.186***	0.486***	0.118*	0.246***	0.129	1,369
	(0.067)	(0.045)	(0.046)	(0.071)	(0.052)	(0.079)	
	[0.198, 0.459]	[0.098, 0.273]	[0.396, 0.575]	[-0.022, 0.257]	[0.144, 0.348]	[-0.027, 0.284]	
Process innovation	0.377***	0.065	0.462***	0.295***	0.325***	0.030	1,176
	(0.067)	(0.044)	(0.048)	(0.075)	(0.054)	(0.087)	
	[0.246, 0.508]	[-0.021, 0.150]	[0.368, 0.557]	[0.147, 0.443]	[0.219, 0.431]	[-0.141, 0.201]	
Distribution/ logistics innovation	0.390***	0.050	0.537***	0.402***	0.519***	0.117	697
	(0.082)	(0.061)	(0.059)	(0.084)	(0.047)	(0.082)	
	[0.230, 0.550]	[-0.070, 0.171]	[0.421, 0.652]	[0.238, 0.566]	[0.426, 0.612]	[-0.044, 0.278]	
Organisational innovation	0.447***	0.193***	0.562***	0.330***	0.449***	0.119	697
	(0.075)	(0.058)	(0.062)	(0.088)	(0.053)	(0.087)	
	[0.300, 0.594]	[0.078, 0.307]	[0.441, 0.682]	[0.158, 0.502]	[0.345, 0.553]	[-0.051, 0.289]	
Marketing innovation	0.393***	0.177***	0.566***	0.248***	0.407***	0.158*	785
	(0.079)	(0.061)	(0.061)	(0.094)	(0.049)	(0.094)	
	[0.239, 0.547]	[0.058, 0.296]	[0.446, 0.686]	[0.063, 0.434]	[0.310, 0.504]	[-0.027, 0.344]	

Notes: Standard errors in parentheses: 95% confidence intervals in square brackets

*** p<0.01, ** p<0.05, * p<0.1

ATET is average treatment effect on the treated

[a] Raw observations

For brevity, matched (control and treated) observations are not shown

5. CONCLUSION

This study sought to provide insights on innovation profiles of SMEs in Africa by considering the impact of three very important regional specificities – low levels of human capital and absorptive capacities, financial constraints, and the dominance of traditional low to medium tech industries – on the adoption and efficacy of innovation modes. This objective was based on theoretical gaps in literature namely (1) a dearth of insights on how the regional specificity of absorptive and technical capacities (Trippl 2011; Parrilli et al. 2020) influence the adoption and effectiveness of innovation modes (STI, DUI or both) in developing countries. (2) A dearth of comprehension on which innovation modes (STI, DUI or both) align with predominant industries in developing countries such as traditional low tech industries in the context of Africa (Wintjes et al. 2014; IMF 2018). And (3) how financial constraints influence innovation profiles of SMEs in developing countries (Beck 2007; Fowowe 2017).

The findings of this study indicate that there are unique innovation profiles of SMEs in Africa which are driven by regional specificities. First, it is noted that many SMEs in Africa are associated with DUI innovation drivers which stems from the dominance of traditional low to medium tech industries, and weak technological and absorptive capacities in Africa. This is an interesting finding that contrasts very much with the innovation adoption profiles in advanced countries (where there is a relatively lower adoption of DUI drivers and a higher adoption of STI drivers) and indicates that there is still more to be done to improve the profile of industries (IMF 2018) and to foster firm innovation in Africa (World Bank 2017). Second, it is noted that SMEs that utilise STI drivers alone or in combination with DUI drivers generate higher

innovation outputs in general than SMEs utilising DUI drivers alone. This finding aligns with similar studies in advanced countries but novel to the context of Africa (Jensen et al. 2007; Chen et al. 2011; Isaksen and Nilsson 2013; Parrilli and Heras 2016). It demonstrates the effectiveness of scientific and technical activities in driving a variety of innovations (Rammer et al. 2009; Trippl 2011; Parrilli and Elola 2012), yet very few firms in Africa adopt scientific and technical activities.

Third, it is noted that SMEs that adopt a combination of STI and DUI drivers generate greater business process (or non-technological) innovations than those that rely solely on DUI drivers. This finding is unique and context specific, indicating that despite SMEs generating modest business process innovations from mainly DUI activities in Africa, the addition of STI activities provides a boost to the generation of business process innovations because scientific, and technical knowledge has a more direct application to innovations (Rammer et al. 2009; Fitjar and Rodríguez-Pose 2013). Fourth and finally, it is noted that financial constraints have a greater effect on the generation of product (technological) innovations than on business process (non-technological) innovations for SMEs in Africa. This may be because STI drivers which are mainly associated with product innovations (Jensen et al. 2007; Parrilli and Heras 2016) are more prone to the effects of financial constraints (Brown et al. 2012).

These are interesting findings in the context of Africa and have some policy implications. For instance, based on the finding that SMEs in Africa operate mainly in traditional low to medium tech industries and that when STI drivers are employed alone or in combination with DUI drivers, greater innovation outputs are generated, it

is recommended that SMEs in Africa and possibly some other developing countries are aided to fuse STI and DUI innovation activities to reap greater benefits.

There are a few limitations to this study which are mainly related to the limited variety of indicators of DUI drivers in the panel sample. It is hoped that future WBES surveys include more indicators of learning through cooperation and interactions with suppliers and customers. It would be insightful for future studies to identify innovation profiles in other developing regions or countries.

CHAPTER SEVEN – FINAL IMPLICATIONS AND CONCLUSION

7.1 CHAPTER OVERVIEW

This chapter presents the conclusions and implications of this PhD study. It also draws together the findings of all four papers presented in this thesis.

7.2 INTRODUCTION

There is little doubt about the contribution of SMEs to the economies of countries worldwide (Ayyagari et al. 2007; Danuta 2015; Karadag 2015; ILO 2019; World Bank 2021b). Their role in developing countries is perhaps more substantial, contributing to about 70% of GDP, 85% of manufacturing employment, and 75% of general employment (Beck et al. 2005a).

Despite the enormous contribution of SMEs to the economic fabric in many countries, SMEs in Africa like many developing countries tend to be less productive, pay lower wages, and are less likely to introduce new products and services than large firms (World Bank 2013; ILO 2019). Besides these limitations, access to finance is the greatest resource constraint faced by SMEs in African countries (Beck 2007; Naudé 2010; Wang 2016; Fowowe 2017). About 40% of SMEs in developing countries (including African countries) do not have access to sufficient finance to operate, stifling their growth and economic potential (IFC 2017). Additionally, the World Bank estimates that SMEs in developing countries have an unmet financing need of 5.2 trillion USD each year which is about 1.4 times the current annual global supply of finance to SMEs (World Bank 2021b).

7.3 RESEARCH OBJECTIVES

Over the decades scholars and policy makers have sought for insights on the operations, strengths, and deficiencies of SMEs with the aim of providing tailored interventions to support these peculiar firms. Among such insights, are studies that underscore the influence of the business environment (BE) (sometimes referred to as business climate, investment climate, or entrepreneurial ecosystem) on the behaviour, operations, and performance of SMEs. The main theme in BE literature is that the BE steers almost all entrepreneurial activities. A good BE influences positively the performance of firms, creates opportunities for investment, improves innovation output, and creates competition amongst other things (World Bank 2004; Dethier et al. 2011; Trippl 2011; Ehigiamusoe and Samsurijan 2020; Parrilli et al. 2020; World Bank 2020a). Furthermore, SMEs like all firms, are adaptive structures that are shaped in reaction to their external environment (Selznick 1957; North 1990; Mair and Marti 2009), so, understanding how the general BE and different dimensions of the BE impact the operations and performance of SMEs are essential keys to providing highly tailored policies and interventions in developing countries (World Bank 2004, 2020a).

Consequently, this PhD project sought to explore how an under-researched, yet critical component, of the BE – the institutional and RBE – impact the operations and performance of SMEs in African countries. For instance, while it is known that good macroeconomic conditions increase the supply of finance (Denizer et al. 2000; Peek et al. 2003; Claessens and Kose 2017), very little is known on whether an enabling institutional and RBE improves the supply of finance and impact the funding choices

of SMEs. While it is known that some dimensions of an enabling RBE, such as a good business licensing and registration environment, improves the operations and financial performance of many firms (Alfaro and Chari 2014; Fernandes et al. 2018), would other enabling RBE dimensions (such as trade facilitation) necessarily improve the performance of SMEs in Africa?

Moreover, despite an extensive pool of literature that examine the finance – performance relationship of firms – see for instance Carpenter and Petersen (2002); Abor (2005); Beck et al. (2008a); Beck et al.(2008b); Mallick and Yang (2011); Bilgin et al. (2012); Kumar and Rao (2015); and Ayyagari et al.(2017) – there are mixed findings in literature on how different sources of funding impact the financial performance of firms. A reason for these mixed findings might be the endogeneity of funding sources, which is often unaccounted for in many studies. For instance, the BE (including institutions and the RBE), and a firm's previous financial performance may have a bearing on its current funding choices (Cassar and Holmes 2003; Abor and Biekpe 2009) and financial performance (Weill 2008; Alfaro and Chari 2014; Fernandes et al. 2018). Consequently, would accounting for the endogeneity of funding sources impact the eventual financial performance of firms?

Finally, despite numerous studies that demonstrate the importance of innovation to businesses in all countries such as in giving businesses a competitive edge (Bigliardi 2013; Pomegbe et al. 2020), improving financial performance (Aas and Pedersen 2011) and creating jobs (Ciriaci et al. 2016), very little is known on how the

institutional environment of the general BE shape the innovation profiles and output of SMEs in African countries.

Accordingly, the central objective of this PhD thesis was to explore how elements within the BE – such as institutions, the RBE, and innovation systems – impact (1) access to finance and funding choices; (2) the financial performance; (3) the funding choices – financial performance relationship, and (4) the innovation profiles and output of SMEs in African countries. Each of these three objectives was addressed in a corresponding academic paper.

7.4 RESEARCH METHODOLOGY

The sample employed was derived from the extensive World Bank Enterprise Surveys (WBES). The WBES is a vast data repository that provides firm-level data of over 125,000 firms across 139 countries. The selected sample consist of panel datasets of 27 African countries yielding a rich unbalanced panel sample of 39,461 firm observations covering surveys conducted between 2003 and 2019.

This PhD study employed panel regressions, Propensity Score Matching (PSM), and structural equation modelling (SEM) methods for econometric analysis following similar studies (Baum and Locke 2004; Dollar et al. 2005; Dethier et al. 2011; Fowowe 2017; Quartey et al. 2017; Parrilli et al. 2020). Even though, similar studies have traditionally employed regressions to analyse relationships involving the BE of firms, standard regressions are prone to multicollinearity, endogeneity issues, and self-

selection biases that sometimes confound the estimations (Cavaco et al. 2016; Wooldridge 2016; Ghosh 2017). Thus, PSM and SEM methods are employed. PSM methods are more effective in establishing causal relationships by disentangling the influence of the treatment from other covariates that may well influence the outcome construct (Phillipson et al. 2019). Moreover, SEM is a technique that combines factor analysis, path analysis, and multiple regression analysis amongst others, to determine the relationship between observed and unobserved variables (Kaplan 2001; Wooldridge 2010). Thus, following similar studies, PSM and SEM methods were deemed to be appropriate empirical methods to test the substantive objectives of this PhD study (Baum and Locke 2004; Dollar et al. 2005; Dethier et al. 2011; Yazdanfar and Öhman 2015a; Fowowe 2017; Quartey et al. 2017; Parrilli et al. 2020).

7.5 KEY FINDINGS

The overarching theory employed in this PhD study is the institutional theory. As far back as the 1950s, Selznick (1957), suggested that the organisational structure was an adaptive vehicle that was shaped in reaction to the effects of participants as well as the external environment. Since then, the theory of institutions and institutional voids has been expanded in literature (North 1990; Scott 1995). For instance, Khanna and Palepu (1997) introduced and defined 'institutional voids' as the absence or underdevelopment of institutions that enable and support market activity. This network of systems or institutions includes political, financial, legal, and regulatory systems that provide an enabling environment for entrepreneurship (Saul et al. 2013). The absence of these institutions is termed an institutional void (Mair and Marti 2009).

African countries like many developing countries struggle with the provision of adequate institutions (Beck et al. 2008b). In instances where these institutional arrangements are present, they are often weak or ineffective (Xiaowei and Chi-Nien 2013). Extant literature frequently points to the predominance of poor regulatory institutions in developing countries which should provide policy and regulation of markets for businesses (Smallbone et al. 2001; Agarwal and Mohtadi 2004; Kaivanto and Stoneman 2007; Beck et al. 2008a). For instance, many African countries have poor tax regulation and administration systems (Adegboye et al. 2018). Thus, many businesses in African countries view obstructive tax regulation and administration as a burden to their businesses, stifling productivity (Abrie and Doussy 2006; Adegboye et al. 2018).

The first key finding in paper 1 of this PhD study is that an enabling institutional and RBE increases SMEs' access to (or supply of) finance from financial institutions in African countries. Even though, access to finance is still a major challenge for many SMEs in African countries (Rahaman 2011; Mazanai and Fatoki 2012; Abor et al. 2014), and financial institutions such as commercial banks charge higher fees and interests on loans granted to SMEs (Beck et al. 2008b; Quaye 2014), an enabling institutional and RBE has a positive impact on the operations of financial institutions. For instance, a commercial bank that has adequate support from the financial sector regulator and perhaps incentives to lend to SMEs would be more likely to put in measures to counter the hurdles normally faced by banks in understanding the needs of SMEs. Perhaps, this would include setting up special packages, desks and allocating

staff to address the needs of SMEs. Indeed, an enabling institutional and RBE should certainly make finance more accessible from commercial banks. However, access to (or the supply of) finance does not necessarily translate to increased patronage by African SMEs in enabling institutional and RBEs. Why?

While an enabling institutional and RBE improves access to finance from financial institutions, it also increases SMEs' funding from retained earnings (Bassetto et al. 2015; Zabri et al. 2015; Paulo 2018; Nguyen 2020). Theoretically, SMEs generally prefer funding from retained earnings over external finance for investment, expansion, and growth (Bassetto et al. 2015; Mishra and Cooper 2017; Nguyen 2020) which is attributable to pecking order and /or trade off behaviour (Myers and Majluf 1984; Hussain et al. 2006; Bassetto et al. 2015; Mishra and Cooper 2017), however, the central argument in this study is that these choices can most certainly be attributed to the availability of retained earnings gained from improved productivity and financial performance in enabling RBEs. In other words, SMEs located in enabling (or better) institutional and RBEs in Africa can allocate and employ significant amounts of retained earnings for investment and growth because they are most likely to have improved financial performance and make profits (see Appendix, Tables 2 and 3 for additional robustness tests that confirm this). These profits can then be applied as retained earnings to their businesses. Moreover, external forms of finance in Africa remain relatively expensive even though available (Beck et al. 2008b; Quaye 2014), thus, SMEs in enabling institutional and RBEs will typically opt for retained earnings over any form of external finance.

In fact, this argument of improved productivity and financial performance in enabling institutional and RBEs for SMEs in African countries is further expanded in paper 2, where it is found that not all dimensions of an enabling institutional and RBE improve the financial performance of SMEs in Africa. For instance, while an enabling business licensing and tax administration environment improves the performance of SMEs, an enabling trade facilitation environment impedes the performance of SMEs in African countries. These findings are in tune with literature that indicate that favourable business registration support services (Alfaro and Chari 2014; Demenet et al. 2016; Fernandes et al. 2018) and tax administration (Rocha et al. 2018; Harju et al. 2019) improve the performance of firms in developing countries, whereas trade facilitation creates competition from foreign firms (Hunt et al. 2007; Terzİ 2010; Siddiqui 2015), which is not beneficial to SMEs due to their limited capacities to compete. It seems, therefore, that the benefits that come with increased trade liberalisation and trade across borders do not reach SMEs, at least in the context of Africa. Trade facilitation acts against its intended purpose of improving the performance of SMEs.

However, given that SMEs in Africa have unique funding choices which is minded by the institutional and RBE, do these funding choices lead to performance heterogeneities? Providing answers is imperative because there are mixed findings in literature on how different sources of funding impact the financial performance of firms. Consequently, paper 3 of this thesis provided conclusive contributions on this thread in literature. For instance, evidence was found to support the view that working capital funding from internal sources (such as owners, family, and friends, and retained earnings) results in weaker financial performance for SMEs in African countries. This finding confirm that SMEs in African countries are generally financially constrained

(Abor et al. 2014; Fowowe 2017) and so rely on internal sources (such as from owners, family, friends and retained earnings) to fund their operations (Mallick and Yang 2011; Zabri et al. 2015; Akinkoye and Akinadewo 2018). This funding behaviour, however, leads to poor financial gains since internal funds are likely to be inadequate for financially constrained SMEs.

Moreover, paper 3 also noted that working capital funding from financial institutions (banking and non-banking) leads to improved financial performance. This is an interesting finding that underscores the line of thought that any access to badly needed external finance should improve the financial performance of SMEs in African countries. This finding agrees with studies that indicate that access to finance increases the financial performance of firms in developing countries (Beck and Demirguc-Kunt 2006; Beck 2007; Kersten et al. 2017). Thus, even though commercial banks provide a lower share of investment loans to SMEs and charge higher fees and interest rates for the loans they give out (Beck et al. 2008b; Quaye 2014), SMEs still benefit by employing even limited funds from commercial banks for their working capital. Moreover, access to finance from non-bank financial institutions such as MFIs are also to some extent helpful in bridging the financing gap for SMEs (Quaye 2014).

Interestingly, and rightly so working capital funding from trade credit results in weaker financial performance for SMEs in African countries. This finding supports the argument in paper 3 that there are limitations to the application of trade credit especially to the operations of firms. Trade credit cannot be diverted to other investments (Burkart and Ellingsen 2004), thus trade credit in itself may not fully

relieve the financial constraints faced by SMEs needing cash for their operations. Moreover, the use of trade credit doesn't come cheap, there are eventual costs that financially constrained firms will need to bear (Cheng and Pike 2003), such as high implicit interest costs passed on by suppliers, and penalties for untimely repayments (Kestens et al. 2012) which take away badly needed cash from a firm's working capital leading to poor financial performance. Thus, working capital funding through trade credit limits the financial performance of SMEs in Africa.

Furthermore, the financial performance of SMEs is closely linked to their capacity to introduce new products and services (ILO 2019). In fact, the World Bank emphasises that despite a unique opportunity to gain high returns from investment in innovation activities, many developing countries (such as those in Africa) are investing less in innovation than richer nations, leading to low growth rates and fewer available jobs for their ever-growing populations (World Bank 2017). Could the institutional environment in developing countries be a contributing factor to poor SME innovation in these countries? Consequently, paper 4 of this PhD thesis sought to provide insights on how the institutional environment shapes the innovation profiles and output of SMEs in African countries.

The findings of paper 4 indicate that there are unique innovation profiles of SMEs in Africa which are driven by regional specificities. First, it was noted that many SMEs in Africa are associated with DUI innovation drivers which stems from the dominance of traditional low to medium tech industries, and weak technological and absorptive capacities in Africa. This is an interesting finding that contrasts very much with the

innovation adoption profiles in advanced countries (where there is a relatively lower adoption of DUI drivers and a higher adoption of STI drivers). Second, it was noted that SMEs that utilise STI drivers alone or in combination with DUI drivers generate higher innovation outputs in general than SMEs utilising DUI drivers alone. This finding aligns with similar studies in advanced countries but novel to the context of Africa (Jensen et al. 2007; Chen et al. 2011; Isaksen and Nilsson 2013; Parrilli and Heras 2016). It demonstrates the effectiveness of scientific and technical activities in driving a variety of innovations (Rammer et al. 2009; Trippl 2011; Parrilli and Elola 2012), yet very few firms in Africa adopt scientific and technical activities.

Third, it was noted in paper 4 that SMEs that adopt a combination of STI and DUI drivers generate greater business process (or non-technological) innovations than those that rely solely on DUI drivers. This finding is unique and context specific, indicating that despite SMEs generating modest business process innovations from mainly DUI activities in Africa, the addition of STI activities provides a boost to the generation of business process innovations because scientific, and technical knowledge has a more direct application to innovations (Rammer et al. 2009; Fitjar and Rodríguez-Pose 2013). Fourth and finally, it was noted in paper 4 that financial constraints have a greater effect on the generation of product (technological) innovations than on business process (non-technological) innovations for SMEs in Africa. This is borne by that STI drivers which are mainly associated with product innovations (Jensen et al. 2007; Parrilli and Heras 2016) are more prone to the effects of financial constraints (Brown et al. 2012).

7.6 CONTRIBUTION AND IMPLICATIONS

The institutional environment has long been recognised as an important dimension of the BE that impacts all firms (Selznick 1957; North 1990; Kaufmann et al. 1999; Mair et al. 2007; Kaufmann et al. 2009; Mair and Marti 2009). This network of systems or institutions includes political, financial, legal, and regulatory systems that provide an enabling environment for entrepreneurship (Mair and Marti 2009; Saul et al. 2013). However, literature on how the institutional and regulatory dimensions of the BE impact the operations of SMEs in developing countries is scarce. Consequently, this PhD study provides an essential contribution to the understanding of how institutions impact the operations of firms. It contributes to the debate on how the institutional and regulatory environment impact the operations and performance of SMEs in developing countries and aligns with calls from the World Bank for such studies to inform policy directions (World Bank 2020a).

For instance, this PhD study contributes to scholarly understanding of how institutions and regulations impact access to (or the supply of) finance in African countries. It is the first study to consider the influence of the institutional and regulatory elements of the BE on access to finance unlike many studies that focus on macroeconomic indicators - see, for example, Bhattacharjee et al. (2009) and Rusu and Roman (2016) - but align with emerging scholarly works that note the importance of the institutional setting in shaping the quality of the BE where firms operate (Belas et al. 2019; Cojocaru and Susanu 2019; Forte and Tavares 2019). This contribution is interesting in that regulatory institutions have an impact on financial institutions which in turn has a bearing on the supply of finance to SMEs. This presents a challenge to policy makers

and Governments on the need to go beyond interventions targeted at macroeconomic conditions and to widen these to include regulatory institutions in Africa. In fact, it seems that regulatory institutions have perhaps a greater and more direct impact on the operations and performance of financial institutions.

Moreover, this study highlights the role played by the institutional and RBE on funding choices of SMEs in Africa. Traditionally, the funding choices of SMEs is explained by theories such as the Pecking Order Theory (POT), Trade-off Theory (TOT), which still hold to some extent (Kraus and Litzenberger 1973; Myers and Majluf 1984; López-Gracia and Sogorb-Mira 2008; Kumar and Rao 2015; Zeidan et al. 2018; Rao et al. 2019). However, this study extends the literature on these theories to cover the influence of enabling institutions which improve productivity and profitability of SMEs. This increased productivity in enabling institutional and RBEs leads to a greater reliance on internal funding – such as finance from family and friends and retained earnings. Moreover, internal funds are cheaper alternatives amongst the sources of funding available to SMEs in developing countries (Bassetto et al. 2015; Mishra and Cooper 2017), thus productive (and possibly profitable) SMEs would certainly employ first these funds. These findings should be of interest to policy makers in the sense that they reveal that the institutional and RBE drives the financing choices of African SMEs in addition to pecking order behaviour.

Quite interestingly, another related contribution to literature is that this funding behaviour of SMEs in African countries (which is an over reliance on internal funding), leads to weaker financial performance mainly because SMEs in these

countries remain financially constrained. This finding aligns with the unusual findings of some authors that the use of retained earnings (even though cheap) did not increase the financial leverage and equity of firms (Baloch et al. 2015; Koussis et al. 2017), and supports Biglin et al.'s (2012) study that demonstrated that the use of informal sources of finance were detrimental to the performance of firms in developing countries. These insights present an essential challenge to policy makers, Governments, donor agencies, financial institutions and so forth on tailoring interventions, and properly aligning measures and initiatives aimed at making varied affordable finance available for SMEs in African countries. These interventions may include the provision of credit infrastructure (credit bureaus, collateral registries), credit guarantees, secured transaction reforms and matching grants as suggested by the World Bank (Bruhn 2016; World Bank 2019a). Providing affordable varied funding to SMEs cannot be overemphasized.

Additionally, this PhD study makes an essential contribution to literature by highlighting the role played by different institutional and regulatory elements on the financial performance of SMEs in African countries, unlike most studies that focus on the influence of firm-related factors (Beck and Demirguc-Kunt 2006; Abor and Biekpe 2009; Yuko et al. 2015; Rostamkalaei and Freel 2016; Coetzee and Buys 2017; Cowling et al. 2018), and entrepreneur-related factors (Irwin and Scott 2010; Makler et al. 2013; Vasilescu 2014; Li 2015; Yuko et al. 2015; Pallegedara 2017). This study demonstrates that not all dimensions of a supposed enabling institutional and RBE improve the financial performance of SMEs. These findings should be of interest to policy makers and governments, especially in Africa. It is suggested that initiatives aimed at improving the regulatory framework in African countries be fine-tuned, so

they benefit SMEs. For instance, while the provision of adequate business licensing and registration system significantly increases formality and improves the performance of firms (Alfaro and Chari 2014; Demenet et al. 2016; Fernandes et al. 2018), trade liberalization needs to be carefully thought through and implemented in such a way that SMEs are not disadvantaged. These findings also provide support for measures and initiatives (such as regulatory reform, business registration reform and business skills and practices training) aimed at bolstering institutional support for firms in Africa developing countries (Bruhn 2016; Ayyagari et al. 2017; World Bank 2019a). This, in turn, would significantly improve the overall quality of the BE in developing countries.

Finally, this PhD thesis contributes to literature on how the institutional environment of the general BE shapes the innovation profiles and output of SMEs in African countries. It contributes to literature of innovation systems in African countries and its influence on innovation activities and output. It also contributes to the debate on which innovation modes are most effective for specific countries or regions and provides a better understanding of which innovation drivers policy makers could enhance to foster growth in developing countries. For instance, this study extends the understanding of predominant innovation drivers in Africa. It finds that many SMEs in Africa are associated with DUI innovation drivers which stems from the dominance of traditional low to medium tech industries, and weak technological and absorptive capacities. This finding contrasts with the innovation adoption profiles in advanced countries (where there is a relatively lower adoption of DUI drivers and a higher adoption of STI drivers) and indicates that there is still more to be done from a policy

perspective to improve the profile of industries (IMF 2018) and to foster firm innovation in Africa (World Bank 2017).

A related contribution to innovation literature is the link between specific innovation drivers and innovation output in Africa. This study finds that SMEs that utilise STI drivers alone or in combination with DUI drivers generate higher innovation outputs in general and greater business process (or non-technological) innovations than SMEs utilising DUI drivers alone. This understanding is novel to literature on innovation in Africa and demonstrates the effectiveness of scientific and technical activities in driving a variety of innovations (Rammer et al. 2009; Trippl 2011; Parrilli and Elola 2012), even though very few firms in Africa adopt scientific and technical activities. Consequently, it is recommended that policies are aimed at aiding SMEs in Africa (and possibly some other developing countries) to adopt more formalised, and rigorous approaches to innovation that can be tracked, implemented, and improved (Parrilli and Elola 2012). In fact, scientific activities are the main driver of innovation success for SMEs (Rammer et al. 2009). This is essential because, despite a unique opportunity to gain high returns from investment in innovation activities, many developing countries (such as those in Africa) are investing less in innovation activities than richer nations, leading to low productivity, innovations, financial performance and growth rates (World Bank 2017; ILO 2019), thus these insights would be invaluable to Governments and policy makers.

7.7 LIMITATIONS

There are some limitations to this study that need to be acknowledged.

First, the WBES sample employed has limitations. While the WBES is a highly extensive data repository that provides firm-level data of over 125,000 firms across 139 countries, the firms surveyed are formally registered firms which creates a bias (World Bank 2019b, 2020b). This is an essential limitation in this PhD study since according to some estimates the informal economy accounts for up to 60% of the workforce in developing countries compared to just about 17% in OECD countries (Dessy and Pallage 2003; Ihrig and Moe 2004; Henley et al. 2009). In fact, enterprises in developing countries are often set up as a response to poverty and unemployment, taking advantage and absorbing much of the informal and unemployed workforce (Nguimkeu 2014). Moreover, many informal firms in developing countries also do not seek to be formalised because they have little desire to grow or to access formal sources of finance or simply because they would prefer to be 'unknown' to avoid paying taxes (D′Erasmo et al. 2014; Joshi et al. 2014; Rothenberg et al. 2016). Thus, the WBES sample employed, which is made up of formal registered firms, may not fully reflect the distribution of firms in Africa.

Second, the measure of financial performance employed in this study is revenue. Some of the standard measures of SME performance used in literature include sales growth, profit, Return on Assets (ROA), Return on Investment (ROI), Return on Equity (ROE), Revenue per employee, and Tobin's Q (Su and Sun 2011; Soriano and Castrogiovanni 2012; Delis et al. 2017; Hasan et al. 2017; Cao and Leung 2019). Revenue was selected

(that is annual sales of each firm) as the measure of performance of SMEs based on variables available in the sample and following similar studies (Fisman and Svensson 2007; Agostini et al. 2015; Otuo Serebour and Abraham 2017; Xiang and Worthington 2017). However, other measures of financial performance may have advantages. For instance, ROA which is an accounting-based measure, provides a measure of the operations and financial performance of firms and is widely employed (Su and Sun 2011; Delis et al. 2017; Nasrallah and El Khoury 2021). Thus, ROA may have some advantages over the measure of financial performance employed in this study, which is revenue.

Third, while the definition of SMEs in the context of Africa and the WBES are firms with up to 99 employees (World Bank 2020b), the measure of SMEs employed in this study are firms with up to 250 employees (ILO 2019; European Commission 2020). Relatedly, this study does not consider the effects of institutions and regulations on different categories of SMEs. For instance, micro firms (1-4 employees) in Africa may have dissimilar characteristics to medium sized firms (20 – 99 employees) and may respond differently to the institutional and RBE which is not covered in this study.

Fourth, this thesis focuses on three main dimensions of the institutional and RBE of SMEs in Africa, namely tax administration, business and licensing regulations, and customs and trade regulations. Other regulatory dimensions could be the focus of future studies.

Fifth, the sample employed is based on WBES African datasets. While the term developing countries encompasses numerous countries in different regions and continents (World Bank 2015), the findings of this study are very much limited to developing countries in Africa. In fact, the World Bank uses more precise terminology which are: low, lower-middle, upper-middle income countries to designate developing countries; and high income countries to designate advanced countries (World Bank 2021a). Thus, the findings of this PhD study could strictly be interpreted as being peculiar to Africa.

Sixth, the panel sample employed is unbalanced which means that some firms are only surveyed once (Wooldridge 2010, 2016). This also means some expected data on follow up surveys are missing from the sample. According to Wooldridge (2016) this is a limitation if the missing data is correlated with the idiosyncratic errors leading to biased estimations. However, Propensity Score Matching (PSM) methods, and structural equation modelling (SEM) methods employed in this study effectively deal with this potential limitation (Kaplan 2001; Cepeda et al. 2003; Wooldridge 2010; Phillipson et al. 2019).

7.8 FUTURE WORK

First, since this study is based on a sample of registered formal firms in Africa, it would be insightful to conduct a similar enquiry based on informal firms. While it is known that informal firms prefer to be unknown to avoid accountability to regulatory institutions (D'Erasmo et al. 2014; Joshi et al. 2014; Rothenberg et al. 2016), the effect

of enabling institutions on informal SMEs is unclear. Such an enquiry could contrast the impact of institutions and the RBE on formal versus informal firms.

Second, since this PhD thesis is based on African countries, it would be exciting to conduct similar studies on other developing countries or regions. Perhaps, other developing countries may exhibit dissimilar finance behaviour, innovation profiles, and performance. This is certainly possible since developing countries vary widely in the strength and character of regulatory institutions and other elements of their business environments (World Bank 2021a).

Third, it would also be insightful to consider other emerging sources of finance for SMEs such as bonds, equity, business angels, and crowdfunding and how these sources of finance are impacted by regulatory institutions.

Fourth, a similar enquiry that employs other performance measures such as ROA and ROI would be very insightful to confirm some of the key findings of this study.

Fifth, it would be insightful to consider the findings of this study in relation to the different categories of SMEs such as micro and small firms.

Sixth, only three proxies for the institutional and RBE is employed in this study which are: business licensing, tax administration and trade facilitation. It would be revealing

to consider other regulatory institutions such as labour regulations. Moreover, exploring the impact of other determinants of innovation systems such as the RBE on innovation drivers and output in Africa would be very interesting.

Seventh and finally, it is hoped that future WBES surveys include more indicators of learning through cooperation and interactions with suppliers and customers which would aid in assessing DUI activities. It would also be insightful for future studies to identify innovation profiles in other developing regions.

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APPENDICES

Table 1. Sample description (for chapters 1, and 3 to 6)

	Country	Number of firms	Percentage	GDP per capita (USD)[a]	Ease of doing business score[a]	Human Capital Index[b]	Years of survey
1	**Angola**	593	1.79	2,973.6	41.2	0.4	2006, 2010
2	**Benin**	365	1.1	1,219.4	51.7	0.4	2004, 2009, 2016
3	**Botswana**	491	1.48	7,961.3	66.2	0.4	2006, 2010
4	**Burkina Faso**	443	1.33	774.8	51.3	0.4	2006, 2009
5	**Cameroon**	675	2.03	1,497.9	46	0.4	2006, 2009, 2016
6	**Cape Verde**	197	0.59	3,603.8	54	-	2006, 2009
7	**Chad**	233	0.7	709.5	36.7	0.3	2009, 2018
8	**Cote d'Ivoire**	739	2.23	2,286.2	58.3	0.4	2009, 2016
9	**DRC**	1,388	4.18	545.2	35.2	0.4	2006, 2010, 2013
10	**Egypt**	4,689	14.12	3,020.0	58.5	0.5	2008, 2013, 2016
11	**Ghana**	1,181	3.56	2,202.1	60.4	0.5	2007, 2013
12	**Kenya**	1,991	6	1,816.5	71	0.6	2007, 2013, 2018
13	**Liberia**	220	0.66	621.9	43.5	0.3	2009, 2017
14	**Malawi**	790	2.38	411.6	60.4	0.4	2005, 2009, 2014
15	**Mali**	862	2.6	890.7	53.1	0.3	2003, 2007, 2010, 2016
16	**Morocco**	2,390	7.2	3,204.1	71.7	0.5	2004, 2007, 2013, 2019
17	**Niger**	302	0.91	554.6	52.3	0.3	2005, 2009, 2017
18	**Nigeria**	7,342	22.11	2,229.9	53.4	0.4	2007, 2009, 2014
19	**Rwanda**	643	1.94	801.7	75.4	0.4	2006, 2011, 2019
20	**Senegal**	1,677	5.05	1,446.8	54.4	0.4	2003, 2007, 2014
21	**Sierra Leone**	227	0.68	504.5	47.2	0.4	2009, 2017
22	**South Africa**	1,455	4.38	6,001.4	66.7	0.4	2003, 2007
23	**Tanzania**	1,024	3.08	1,122.1	54.3	0.4	2006, 2013
24	**Togo**	245	0.74	675.5	55.3	0.4	2009, 2016
25	**Uganda**	1,098	3.31	776.8	58.4	0.4	2006, 2013
26	**Zambia**	1,048	3.16	1,291.3	65.7	0.4	2007, 2013
27	**Zimbabwe**	897	2.7	1,464.0	50.5	0.5	2011, 2016
	Total (*n*)	33,205	100				

Notes: The total sample size (N) is 39,461 observations

[a] World Bank values for 2019

[b] World Bank HCI values for 2020; global average HCI is 0.56

Table 2. ATET robustness tests of Nearest Neighbour Matching (3) using the objective RBE treatment

	Profitability
ATET	1.905***
	(0.086)
Observations:	
Total Raw	13,217
Total matched	15,720
Treated matched	7,860
Control matched	7,860

Notes: Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
ATET is average treatment effect on the treated
The following covariates are included in all models: size of firm, age of firm, status of firm, human capital of O/M, gender of O/M, sector of firm, year of survey, GDPC of country

Table 3. ATET robustness tests of Inverse Probability Weighting using the objective RBE treatment

	Profitability
ATET	1.459***
	(0.162)
POM[a] (Enabling BE)	10.310***
	(0.161)
Observations:	
Total raw	13,217
Total weighted	13,217
Treated weighted	7,181
Control weighted	6,036

Notes: Standard errors in parentheses
*** p<0.01, ** p<0.05, *
p<0.1
ATET is average treatment effect on the treated
[a]Potential outcome
mean
The following covariates are included in all models: size of firm, status of firm, age of firm, human capital of O/M, gender of O/M, sector of firm, year of survey, GDPC of country