

Development Finance and the Development of Financial Equity Markets: The Case of the
Oil and Gas Industry in Africa

by

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Thesis submitted in fulfilment of the requirements for the degree of
Master of Management in Finance & Investment

in the

FACULTY OF COMMERCE LAW AND MANAGEMENT
WITS BUSINESS SCHOOL

at the

UNIVERSITY OF THE WITWATERSRAND

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DECLARATION

I, Andrea Africa declare that the research work reported in this dissertation is my own, except where otherwise indicated and acknowledged. It is submitted for the degree of Master of Management in Finance and Investment in the University of the Witwatersrand, Johannesburg. This thesis has not, either in whole or in part, been submitted for a degree or diploma to any other universities.

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ABSTRACT

This paper analyses the provision of development finance to oil and gas exploration and production (E&P) firms through Development Finance Institutes (DFIs) in Africa. The paper aims to determine the state of equity markets and development finance in Africa and the level at which they contribute to the financing of oil and gas projects in Africa. The main question to be answered: is small firm participation sustainable in the oil and gas industry if equity markets do not develop to meet the financing needs in Africa? It is found that development finance contributes a small proportion of capital into oil and gas deals and financial equity markets play an even smaller role in garnering finance for capital intensive projects in the oil and gas industry as most finance is sourced externally or from internal cash flows. Small firms tend to reduce their interest in oil and gas projects based on lack of access to domestic finance through equity markets and limited development finance availability.

Key words: Development finance, financial equity markets, oil and gas in Africa

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Chapter 1: Introduction

1.1 Problem Statement

Financial equity markets are largely underdeveloped in Africa (Allen, Othare, and Senbet, 2011). Therefore, the source of capital from domestic equity markets, for firms that seek funding for infrastructure development is limited. Consequently, to source funding various routes of external financing are opted for. These routes come in the form of accessing international capital markets or debt financing from international commercial banks. Another source of financing which is particular to developing economies is development finance from Development Financial Institutions (DFIs). This form of financing is provided to small public and private firms that invest in developing countries.

Development finance contributes a small and limited percentage to the overall infrastructure investment cost. The infrastructure required in oil and gas industries pertain to development and production facilities which are capital intensive. The caveat is that the oil and gas industry is able to leverage on external financing for infrastructure projects based on the large firms¹ that are present in Africa. This is because the large firms have access to their international markets and the nature of oil revenues itself lends it to be attractive for finance. Therefore, small independent² firms in the oil and gas industry are financially exposed to unsustainable participation based on a lack of access to sufficient capital domestically and costly international financing.

1.2 Purpose of Study

The purpose of the study is to understand the relationship between the sustainable participation of small independent firms in the oil and gas industry and domestic access to finance. The study

¹ Often referred to as “Majors” which have a market capitalization of over USD 100 billion on average (see appendix)

² Independent firms are those involved in upstream activity solely with no interest in midstream and downstream activity. Firms involved in the full value chain of oil and gas activity are described as being integrated

aims to determine whether there is a trend towards sustainable participation of small firms³ where development finance exists in consideration of the level of development of domestic equity markets in the African states that have oil and gas activities. The focus will be aimed at oil and gas development and production activity in Africa.

1.3 Research Questions

It has been established that to finance the activities in the oil and gas industry equity markets and development finance contribute to the development of oil and gas projects. The overarching research question will be:

Is participation by small independent oil and gas firms sustainable given the level of development finance and the state of domestic equity markets in Africa?

1.4 Significance of Study

The development of domestic capital markets employs a vital role in the efficient capital allocation to domestic growth opportunities (Bena and Ondko, 2012). Given that domestic capital markets are considered underdeveloped in Africa, this presumes that capital allocation to growth opportunities in Africa are largely inefficient based on the sources of external finance.

This poses a challenge for small firms that want to participate in growth sectors like oil and gas. Raising finance to participate in these sectors is not only challenging but confines participation to minor interests levels in infrastructure projects. Larger firms tend to leverage funding from external sources and are able to bypass an environment of underdeveloped domestic capital markets.

Development finance has a mandate to aid economic growth by selecting infrastructure projects to finance. This type of project financing offers some relief to small firms that require the risk-supported aid. However, the strength of development finance is on the back of underdeveloped

³ In the oil and gas industry

equity markets. The two sources of financing tend to compete against each other and they tend not to coexist. Development finance exists where financial systems require further development. Developed capital markets exist where limited development finance is required. Their existence is antithetical.

This introduces an interesting dynamic between the domestic sources of financing and the sustainable participation of small firms. Mainly because small firms would rely on relief from development finance given the underdeveloped state of equity markets. On the contrary, large firms are able to access external financing which creates barriers to entry which limits the options available to small firms in the industry due to the capital the larger firms are able to command in funding project development activities.

1.5 Research Methodology

Proxies to indicate equity market development and small firm participation are used and the data informing the level of development finance offered to firms will be used. Control variables relating to the oil and gas industry will be included in the empirical analysis along with financing from commercial banks and overall upstream deals in monetary terms. A sample of countries is used to evaluate the empirical relationship between the said parameters. The data will be sourced from various databases and studies.

1.6 Background Literature

The pre-1970s were governed by International Oil Companies (IOCs) which financed oil projects from internal cash flows which resulted in low debt-to-equity ratios according to Razavi (2007, p31). From the 1980s and into the 1990s, National Oil Companies (NOCs) started participating in oil projects but after the 1986 oil price crash, petroleum investments were reined in (Razavi, 1997, p31). In recent times, there has been several financing options, however, access to these options are limited by the level of sophistication of the financial markets in those economies.

The early 1990s allowed access to foreign capital for participants in emerging markets (Bekaert and Harvey, 2003). This access translated into the development of equity markets and foreign direct investment as opposed to debt-based capital (Bekaert and Harvey, 2003). To a large degree this was attributable to market liberalisation (i.e. inward and outward flow of equity investment) (Bekaert and Harvey, 2003). Gooptu (1996) highlights the effect of external financial flows into developing countries in the 1990s; however the lack of analytical frameworks in developing countries prevented a policy position that affected sustainable development. Market liberalisation seems to have been the basis for the growth of capital markets in certain regions. Levine (1997) and Miller (1998) note that the ease of trade on equity markets and diversification of equity markets facilitates economic growth which in turn eases access to capital for firms. However, even with market liberalisation, African financial markets still have few listed companies with low market capitalisation causing them to remain classified as being underdeveloped (Yartey and Adjasi, 2007).

1.6.1 Financial Markets in Africa

Developing economies usually have underdeveloped financial markets which is why companies requiring finance for projects do not resort to domestic capital markets. As a comparison, developed equity markets in certain countries indicate less reliance on bank finance (Yartey and Adjasi, 2007). In which case, investment capital is provided by DFIs in countries that have underdeveloped private markets (Glowacz, 2011). In this analysis, financial market development would be confined to the development of equity markets in developing countries based upon the proliferation of upstream oil and gas asset acquisitions.

The measure of financial market development can be considered as the ease by which any firm would have access to capital (Rajan and Zingales, 2003). Some equity markets in Africa still use manual systems which slow down market transactions (Yartey and Adjasi, 2007). From the stock market handbook published by the United Nations Development Programme (2003) only 18 countries have stock markets in Africa. Of which, only a few of these countries where the exchanges are based are major oil and gas producers, namely: Ghana, Nigeria, Algeria, Cote d'Ivoire and Tanzania. The less prominent producers of oil and/or gas on that list are South

Africa, Morocco, Tunisia and Uganda. Between the period 1992 and 2002, there was a total market capitalisation increase for African markets from US\$113 423 million to US\$244 672 (Yartey and Adjasi, 2007), which is a 115% increase. In Africa only a few strong performers contribute to the growth of total market capitalisation, so the contribution by listed companies is not equitable (Yartey and Adjasi, 2007). The inefficiency of the equity markets and bias in participation indicates that equity markets are underdeveloped in Africa, and as a result DFIs provide an avenue for small firms to access the continent's resource wealth. The relationship between development finance and the development of equity markets needs to be understood. In lieu of wanting equity markets, development finance as it is offered in the industry needs to be explained.

1.6.2 Development Finance

Development finance through Development Finance Institutions (DFIs) could be loosely defined as project finance that is provided by development banks to developing countries. Project finance may be considered as credit to capital intensive projects that use future cash flows as collateral for the required loans (Culp and Forrester, 2010). Development finance is characterised by debt finance with low interest rates and loan repayments over long periods of time for firms financed in developing countries. To ensure sustainability through DFIs, development financiers seek strong returns from their investments (Glowacz, 2011). Strong returns refer to a rate of return that is higher than a defined hurdle rate used to identify profitable opportunities. The use of development finance as a subset of project finance is sometimes used to fill deficits left by other avenues of finance.

Development finance is an alternative means of funding stand-alone, capital intensive projects. Within developing economies, development finance is one of the tools that could effectively stimulate the development of the oil and gas industries in these economies.

1.6.3 Oil and Gas Industry in Africa

Most of the world's proven oil and gas reserves are found in developing countries (Razavi, 1996). Notably, Africa hosts 9.5% of global oil reserves and 8.2% of gas reserves (Ndikumana and Abderrahim, 2010). Given this fact, exploration activities are increasing and so are discoveries in Africa. This brings to the fore the requirement and possible dependence on development finance by small Exploration and Production (E&P) firms within Africa. This provision by DFIs would enable greater indigenous participation in the resource wealth of the continent. So, there is a growing need to fund development and production activities in Africa due to the increasing interest in the region's oil and gas resources. Regularly, petroleum legislation in Africa is being renewed as more discoveries are being made. Renewed legislations aim to promote financial sector development (Wetherill, 2010a). The issue of funding these projects becomes the main point of contention as equity markets are meant to ease the access to raising capital at low costs and result in more profitable projects which stimulate long term growth (Yartey and Adjasi, 2007). However, with underdeveloped equity markets in Africa, companies seem to raise development finance, in some instances, along with some commercial funding (Wetherill, 2010b). Meaning, development finance cannot be relied upon solely to fund infrastructure projects. International oil companies prefer to have several partners in funding oil and gas projects to be able to share project risk and as a result, many countries have encouraged domestic participation (Razavi, 1996). Ultimately, many small Exploration and Production (E&P) companies would turn to Development Finance Institutions (DFIs) for their services and funding as a means to pool funds from different sources.

Africa's oil production growth is expected to be 15% globally in 2015 from a current 12% and gas production is expected to grow just as rapidly (Wetherill, 2010a). Between 2007 and 2010, Africa saw the advent of 22 new oil and gas projects, of which 8 were participated in by DFIs (Wetherill, 2010a). A focus to invest in organic, unproved oil and gas projects in developing countries or indigenous, independent firms will be the focus of the African Development Bank (Wetherill, 2010a). Providing development finance to firms cannot happen in isolation of economic stimulation. The development of financial markets should be studied as a byproduct of the economic development that may occur due to the growth in the funding of projects. King

and Levine (1993) state that financial development occurs when there is capital accumulation within countries which creates economic efficiencies. DFIs stand a chance to participate in oil and gas projects when commercial appetite for capital intensive projects dwindles (Wetherill, 2010a). The dwindling of appetite by credit providers would be due to market-related or other conditions persisting like the current global credit crisis (Wetherill, 2010a). Muhanji and Ojah (2011) confirm that market-related fluctuations, like changes in commodity price, play a critical role in the behaviour of business cycles in Africa therefore influencing financing patterns.

According to the Ente Nazionale Idrocarburi (ENI)⁴ World Oil and Gas report (2008a, b), Algeria is the largest producer of oil and gas in Africa and has the largest reserves. Angola is the second largest oil producer on the continent (ENI, 2008a) but Egypt is deemed the second largest gas producer (ENI, 2008b). However, assessing both oil and gas proved reserves⁵, Nigeria is the top producer according to Ernst & Young (2011), followed by Libya, Algeria, Egypt and then Angola. Recent discoveries from Ghana, Tanzania, Mozambique and Uganda (Ernst & Young, 2011) have contributed to Africa's growing discoveries.

The African Development Bank (2009) admits to contributing a modest proportion of development financing (3.4%) to the extractive industry. The International Finance Corporation (2011) invested in the development of the Jubilee oil field in Ghana in 2009. Ghana, which started producing oil from the Jubilee field in December 2010 is found in eighth position in the 2008 (ENI, 2008a) report. Ghana's ranking has improved given their latest oil discoveries. The equity market in Ghana financed approximately 12% of total asset growth of the companies listed on the exchange between the period 1995 and 2002 (Yartey and Adjasi, 2007). Even with these varied, yet limited, sources of financing, it does not translate into the sustainable participation of small firms in capital intensive projects. This characteristic will be investigated further.

⁴ An Italian integrated oil and gas company with several interests in development and production activity in Africa

⁵ Proved reserves are considered the resources that are commercially recoverable given current economic conditions and available technology

1.7 Outline of the Study

The rest of the research paper will be structured in the following manner. The literature that relates to the research is presented in Chapter 2. Chapter 3 discusses the methodology and contains the description of the data that is used for the empirical analysis of the study including examination of trends and characteristics of development finance and equity markets in Africa. Chapter 4 presents the results and Chapter 5 presents the conclusions of the paper.

Chapter 2: Literature Review

This chapter introduces the literature with respect to financing capital intensive projects and access to finance for firms. It highlights the level of development of equity markets and the role equity markets could play in financing growth opportunities. The chapter is segmented into five parts. Section 2.1 introduces the notion of financing capital intensive projects; section 2.2 describes industry growth opportunities. It is then followed by a review of equity market development in Africa in section 2.3. Section 2.4 and 2.5 respectively address development finance and external financing to firms.

2.1 Financing Capital Intensive Projects

Capital intensive projects have a distinct characteristic in that they require large upfront capital expenditure; therefore, these projects rely heavily on sources of financing. In financing capital intensive projects in developing countries, Dunkerley (1995) points out that there is a growing role for external finance. External finance essentially draws on capital flows internationally to be used domestically. The role of external finance is growing largely because energy investment, therefore, large capital requirements are increasing in developing countries. More particularly, there is a rising trend in capital expenditure in Africa⁶ in the oil and gas arena. With growing capital expenditure requirements but greater emphasis on external finance implies that sources of financing through domestic channels in developing countries prove to be inadequate.

Humphries (1995) identifies the different forms of financing by the oil and gas industry and states the source in ascending order: equity, syndicated debt / project finance, public debt / bonds, commercial paper, derivatives, multilateral agencies, non-traditional financing. The source of financing is mainly external financing and the two markets accessed most for equity and debt financing are traditionally from the London and New York stock exchanges.

⁶ Tullow Oil PLC, an independent company spent USD 1.7 billion in 2012 in Africa and is projected to spend a further USD 2 billion in 2013 in investment expenditure in the upstream oil and gas activity (Tullow Oil, 2013, p12 and 19). This is just one company amongst many with oil and gas investments in Africa.

In lieu of inadequate domestic finance and abundant external financing, Dunkerley (1995) advocates for private capital and confirms that domestic equity markets, currently, will provide only a limited source of capital in developing countries. Despite this reality many markets in developing countries have been liberalised allowing the ease of capital to flow into Africa for investment opportunities. However, the dependence on private capital from external sources has its limitations with regard to the type of firms that would have access to such sources. The potential development of domestic capital markets to source financing is understated in the analysis and syndicated debt is seen as a slightly more viable source of financing. However, the paper does conclude by supporting the development of domestic capital markets for long term finance. The ultimate goal in developing countries is to have, energy project financing being supported by domestic sources of financing.

2.2 Industry Growth Opportunities

Geert and Harvey (2007) find that capital market openness⁷ is more important in aligning growth opportunities than dependence on financial development and external finance. The study analyses the country growth opportunities by studying the country industry mix against price earnings (P/E) ratios. The study indicates that country-specific growth opportunities, measured by P/E ratios are good indicators of future economic activity.

There are various industries that could be analysed within certain growth sectors; however, the selected sector for the purposes of this research paper is the energy sector. The focus on the energy sector and more particularly the oil and gas industry warrants further review of the current growth trajectory that it is exposed to.

Humphries (1995) did not utilise P/E ratios in his analysis of the growth opportunities in oil and gas but he argues that the restrictions in the allocation and cost of capital in the oil and gas industry will determine which companies and projects will be able to proceed. Therefore, innovative financial structures would be required to fund growing capital requirements within the growing industry. In the study, upstream (exploration, development and production) makes up a

⁷ Liberalisation of capital accounts, equity markets and banking systems

larger portion of capital investment compared to the downstream (processing and transportation facilities) portions of the oil and gas value chain. Humphries (1995) confirms that the ability of oil and gas companies to source external finance to meet growing capital expenditure will continue to introduce challenges and threats. However, by identifying different sources of capital, the oil and gas industry will continue to be a growth opportunity in the energy sector.

2.3 The State of Equity Markets

The state of equity markets in Africa is the departure point for this section. Many developing countries are subject to similar underdevelopment in their equity markets, however, the problems and levels of development are not homogenous. Allen, Otchere and Senbet (2011) review African financial systems and dedicate a section of their study to equity market development. The requirement for the development of equity markets is evident. The research highlights that out of fifty-three African states twenty stock exchanges are in operation currently, most of which utilise manual trading and clearing platforms⁸. Despite the low tally, twenty years ago only eight exchanges were in operation in Africa, three of which were in North Africa. Therefore, the growth trajectory over the past twenty years of stock exchanges in Africa is noteworthy. With the evolution and introduction of stock exchanges in Africa, there is also a move towards regional stock exchanges which West African and francophone speaking countries have been able to institute. There is reason to believe that the same regional format would promulgate to Southern and Eastern Africa according to the study. This does not necessarily imply that this will lead to greater development of stock markets in the region. Larger and more efficient stock exchanges would require a comparable level of efficiency from other exchange platforms within the region.

Even though approximately twenty stock exchanges are in operation in Africa, it is important to assess their level of operability through their liquidity. Indirect measures of liquidity are used by Allen, Otchere and Senbet (2011) to conduct their review of African equity markets. Namely,

⁸ Automated trading systems in Africa: Johannesburg Securities Exchange (JSE), Algerian Stock Exchange, Bourse Régional des Valeurs Mobilières (BVRM), the Cairo and Alexandria Stock Exchange (CASE), Stock Exchange Mauritius, Namibia Stock Exchange, Tunis Stock Exchange, Zambian Exchange and Nigeria Stock Exchange (Allen, Otchere and Senbet, 2011)

market capitalisation scaled by Gross Domestic Product (GDP)⁹, volume traded scaled by GDP and the turnover ratio calculated using the volume traded scaled by the stock exchange market capitalisation. Key findings from the study are tabulated in Table 1 below. Their findings indicate that equity markets, with the exception of South Africa and Egypt, are not robust and are illiquid based on the low values obtained from the indirect measure of equity market liquidity. The study highlights how the performance of equity markets is skewed by the dominance of a few large firms trading on the platform. This is a clear indication of underdevelopment of the equity markets based on the bias that is able to exist.

The growth and investment opportunities in Africa are underexploited. This holds particularly true for the oil and gas sector. Currently, private finance is sourced to finance investment and growth opportunities (Allen, Otchere and Senbet, 2011). Eventually, equity markets could flourish to provide an alternate source of financing as more firms list on stock exchange platforms.

2.4 Development Finance

Bajpai (2004) ultimately sets the definition of development finance as it is intended on being used in this paper. The study clarifies the two diverging forms of development finance. In the one form, development finance may be viewed from a governmental perspective and in the second form, from a firm perspective. The latter perspective allows Development Financial Institutions (DFIs) to offer finance to firms for sectoral development. Development finance in this form is offered as long-term risk capital for projects. The findings show that development finance to firms, as examined for India, did not go into decline even with prevalent competition from equity markets and commercial banks. The focus is on India where development finance has taken a competitive form. This might not be the case for other developing countries.

⁹ Indication of the size of the economy

Table 1: Equity market liquidity in Africa

Region	Country	Market capitalisation as a percentage of GDP							Country	Number of listed domestic companies						
		2003	2004	2005	2006	2007	2008	2009		2003	2004	2005	2006	2007	2008	2009
Eastern Africa	Kenya	28	24	34	51	50	32	36	Kenya	51	47	47	51	51	53	55
	Tanzania	7	6	4	4	-	6	-	Tanzania	6	6	6	6	7	7	-
	Uganda	1	1	1.12	1.17	-	-	-	Uganda	3	5	5	5	-	6	8
	<i>Average</i>	<i>12</i>	<i>10</i>	<i>13</i>	<i>19</i>	<i>50</i>	<i>19</i>	<i>36</i>	<i>Average</i>	<i>20</i>	<i>19</i>	<i>19</i>	<i>21</i>	<i>29</i>	<i>22</i>	<i>32</i>
Northern Africa	Egypt	33	49	89	87	107	53	48	Egypt	967	792	744	603	435	373	305
	Morocco	26	44	46	75	101	76	69	Morocco	53	52	56	65	74	77	78
	Tunisia	10	9	10	14	15	16	23	Tunisia	46	44	46	48	50	49	49
	<i>Average</i>	<i>23</i>	<i>34</i>	<i>48</i>	<i>59</i>	<i>74</i>	<i>49</i>	<i>47</i>	<i>Average</i>	<i>355</i>	<i>296</i>	<i>284</i>	<i>239</i>	<i>186</i>	<i>166</i>	<i>144</i>
Southern Africa	Botswana	26	26	23	36	48	27	34	Botswana	19	18	18	18	18	19	20
	Malawi	4	6	8	19	-	42	-	Malawi	40	41	42	41	90	41	-
	Mauritius	37	39	41	56	83	40	55	Mauritius	8	8	9	10	9	14	88
	Namibia	6	7	6	7	8	7	9	Namibia	13	13	13	9	9	7	7
	South Africa	161	211	233	277	294	178	246	South Africa	426	403	388	401	422	425	363
	Swaziland	10	10	8	7	7	-	-	Swaziland	5	6	6	6	6	7	5
	Zambia	17	8	14	11	21	-	-	Zambia	12	13	15	14	15	-	-
	Zimbabwe	67	41	70	-	-	-	-	Zimbabwe	81	79	79	80	82	81	94
	<i>Average</i>	<i>41</i>	<i>44</i>	<i>50</i>	<i>59</i>	<i>77</i>	<i>59</i>	<i>86</i>	<i>Average</i>	<i>76</i>	<i>73</i>	<i>71</i>	<i>72</i>	<i>81</i>	<i>85</i>	<i>96</i>
Western Africa	Cote D'Ivoire	12	13	14	24	42	30	20	Cote D'Ivoire	38	39	39	40	38	38	38
	Ghana	19	30	16	25	16	21	16	Ghana	25	29	30	32	32	35	35
	Nigeria	14	16	17	22	52	23	20	Nigeria	200	207	214	202	212	213	214
	<i>Average</i>	<i>15</i>	<i>20</i>	<i>16</i>	<i>24</i>	<i>37</i>	<i>25</i>	<i>21</i>	<i>Average</i>	<i>88</i>	<i>92</i>	<i>94</i>	<i>91</i>	<i>95</i>	<i>95</i>	<i>96</i>

Source: Allen, Otchere and Senbet (2011) as per the World Development Indicators

Although development finance has been able to find its niche, its relevance depends on competitive forms of finance. Bajpai (2004) offers a complementary perspective to financing from equity markets. The paper acknowledges the requirement for DFIs to change their business model to remain relevant to address competitive sources of finance from commercial banks which have economies of scale and scope along with competitive cost structures. However, in India reforms to the securities exchange market allowed capital markets to become an attractive source of finance. The trend in India shows that the demand for finance from DFIs declined as more private sector finance became available. This trend is analogous to the notions that as domestic capital markets develop and access to external finance eases, therefore, reliance on development finance should decline.

The two findings based on private sector finance and finance from equity markets show that the resultant trend of development finance differs based on the source of finance. Private sector finance saw the decline of development finance while increased equity market financing did not result in the decline in development finance. This indicates the different nature that the two forms of financing take and their resultant effect on development finance. Development finance can compete with equity market financing but is yet to develop a competitive stance against sources from the private sector. Lastly, the paper suggests that DFIs need to alter their business model and start participating in different forms of financing to be sustainable in financing activities. This rings true if DFIs want to maintain their role in sectoral development.

Developed domestic capital markets as a competitor to development finance is a characteristic that is also tested by Gokarn (2004). A different perspective to that of Bajpai (2004) is offered. The study of India's market concluded that domestic capital markets, which would include debt from financial markets, have essentially replaced development finance. This indicates that development finance can compete with equity markets but cannot compete with the entirety of capital markets in India. Therefore, DFIs are participating in financing at a diminishing rate where capital markets are being developed. Despite this trend, it is noted that DFIs are still required to assist in the financing of start-ups that are critical to economic development.

2.5 External Financing of Firms

Rajan and Zingales (1998) conducted a study that showed that the development of financial systems reduces the costs of external finance to firms. The study further linked financial development to economic growth. The rationale used, helps to explain the requirement of firms to reduce costs to ensure that they are able to finance operations at lower costs. Financial systems are a broad category of finance; however, within this category capital markets are included. An even narrower subset of this category would be equity markets. In the study conducted, financial development was measured by the level of credit offered and the size of equity markets (through stock market capitalisation) at country-level. A test notable to this study is whether industries have a predisposition to grow faster when there is a high dependence on external finance (a function of the delta between capital expenditure requirements and operating cash flows in the study for firms listed on United States of America (USA) stock exchanges). For the petroleum industry in the USA, mature firms have a higher reliance on external finance than young firms; similarly, the capital expenditure for mature firms is greater than that of young firms.

Bena and Ondko (2012) addressed the study of financial systems and the allocation of external finance to firms. Financial systems extend towards banking as well as capital markets, therefore, equity markets fall within the ambit of financial systems in this study as well. They find that more developed financial markets are able to allocate capital more efficiently to growth industries. A model to proxy financial development through credit, market capitalisation and volumes traded is used and efficient capital allocation of external finance is proxied by equity raised and long term debt scaled by the firms' assets. The question that is important from their study is the cost of external finance and therefore access to external finance for small firms. The study emphasises that when external finance is too costly internal finance is exhausted. However, small and young firms do not have access to internal finance through cash flow initially. Small and young firms will approach the next tranche of finance, which are financial markets if internal finance is exhausted. However, if domestic financial markets are not developed it will pose a considerable challenge for firms that want to participate in capital intensive projects. The study tests the hypothesis: financial development improves efficiency of

capital allocation by channelling external finance toward firms in industries with the best growth opportunities. The study agrees with the direction of this research paper by attesting that private firms are likely to depend on domestic financial markets, whereas, public firms are in a better position to raise external capital through capital markets. The differentiating factor between the classification of firms is that their use of private firms is congruent to this paper's use of small firms since most of the small independent firms are private. Similarly, their use of public firms is congruent to this paper's use of large firms since most of the major firms in the industry are publically listed.

The two studies by Rajan and Zingales (1998) and the Bena and Ondko (2012) are different by virtue of the former testing dependence on external finance by firms based on the development of financial markets and the latter tests the efficient capital allocation in reference to firms and the development of financial markets. Both studies are relevant to the development of this paper because the former addresses the importance of external finance for firms; and the latter emphasises the incongruence in the allocation of capital if financial markets are not developed. Both studies make use of cross-country regression analysis.

It is apparent that external finance precludes all firms from having access to this source of finance. Ulrich (1990) also advocates for reforms in the external finance structure to support more equity participation¹⁰ to resolve external debt difficulties. As much as this seems like a plausible proposal, the study focuses on development of finance to countries as development aid - which is different to the type of development finance allocated directly to firms through DFIs. Ulrich (1990) makes use of a cooperative and non-cooperative equilibrium (principal-agent) model to test levels of debt capital against equity capital with regards to capital flows to governments. Since the study focuses on external forms of finance transferred to governments, it does not allude to the domestic development of capital markets which is what this paper will focus on. However, the important element in the finding is the structural alteration and reliance of external finance that is required.

¹⁰ Capital transfers in exchange for equity participation

To conclude this chapter, it has been noted that small firms have to obtain private finance through external finance if no access to domestic equity markets are available. This is despite the fact that access to domestic capital would be easier for small firms. DFIs attempt to aid this caveat by providing development finance for sectoral development. Even with all these forms of finance, developed capital markets allow for the efficient allocation of capital to growth opportunities

This research paper relates closely to the all papers reviewed. From the review above it is clear that certain aspects of this paper are dealt with individually but there is no paper that deals with development finance and the development of equity markets solely. However, the study of financial systems and the dependence on external finance tend to link to the requirement for the developed equity markets. Even the study on financial systems and efficient capital allocation steers towards developed capital markets to facilitate efficient capital allocation to growth industry. Undoubtedly, the oil and gas industry is a growth industry based on the number of exploration licenses being issued to a growing number of firms as shown in Figure 1 below.

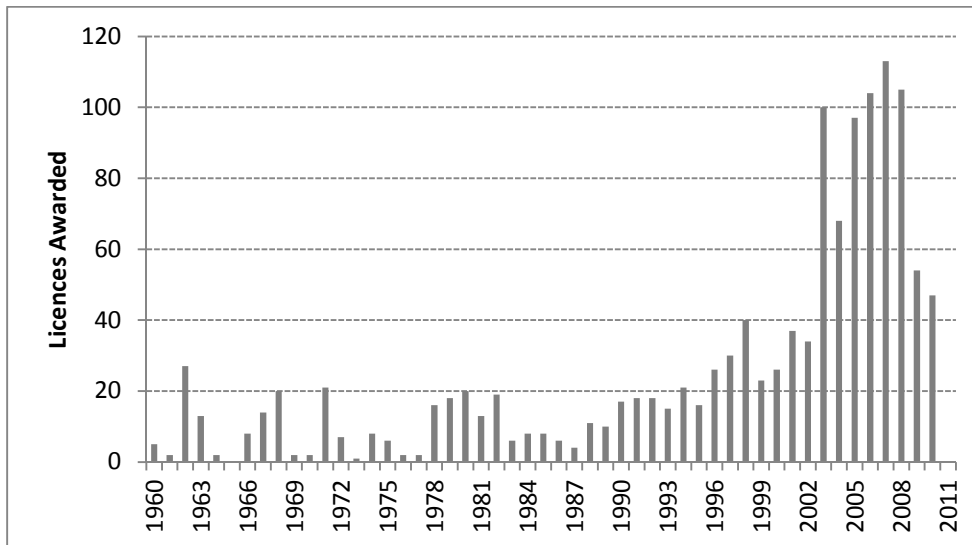


Figure 1: Total license awards for select countries

Includes data for: Tunisia, Tanzania, Sudan, South Africa, Nigeria, Mozambique, Libya, Ghana, Egypt, Cote D'Ivoire, Cameroon, Angola and Algeria

Note: Since the 1960s, the amount of licenses that have been awarded peaked between 2002 and 2008.

Source: Woodmackenzie (2012)

By trending sources of finance, investment in oil and gas activity also seemed to peak before the financial crisis of 2008. Figure 2 shows the trend between deals that were conducted in the upstream oil and gas industry between 2008 and 2010 and development finance that was issued for select upstream oil and gas projects in nominal terms.

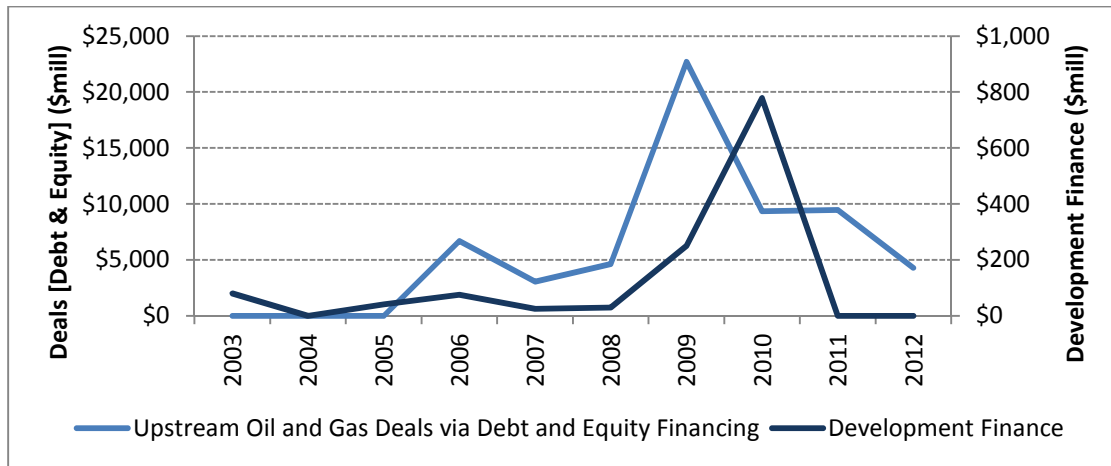


Figure 2: Upstream oil and gas deals; and development finance

Includes data for: Algeria, Angola, Cameroon, Democratic Republic of Congo, Egypt, Gabon, Ghana, Cote D’Ivoire, Libya, Morocco, Mozambique, Nigeria, South Africa, Sudan, Tanzania, Tunisia and Uganda

Source: IFC (2011), Wetherill (2010b) and PLS Derrick M&A database (2012)

As a comparison Figure 3 indicates the sampled commercial finance issued to upstream oil and gas projects between 2008 and 2010 in nominal terms. The trend analysis shows that the sampled commercial finance issued tracks the deals conducted precisely. Humphries (1995) indicated that finance and oil price tend to follow each other. The lagged effect is shown in the figure.

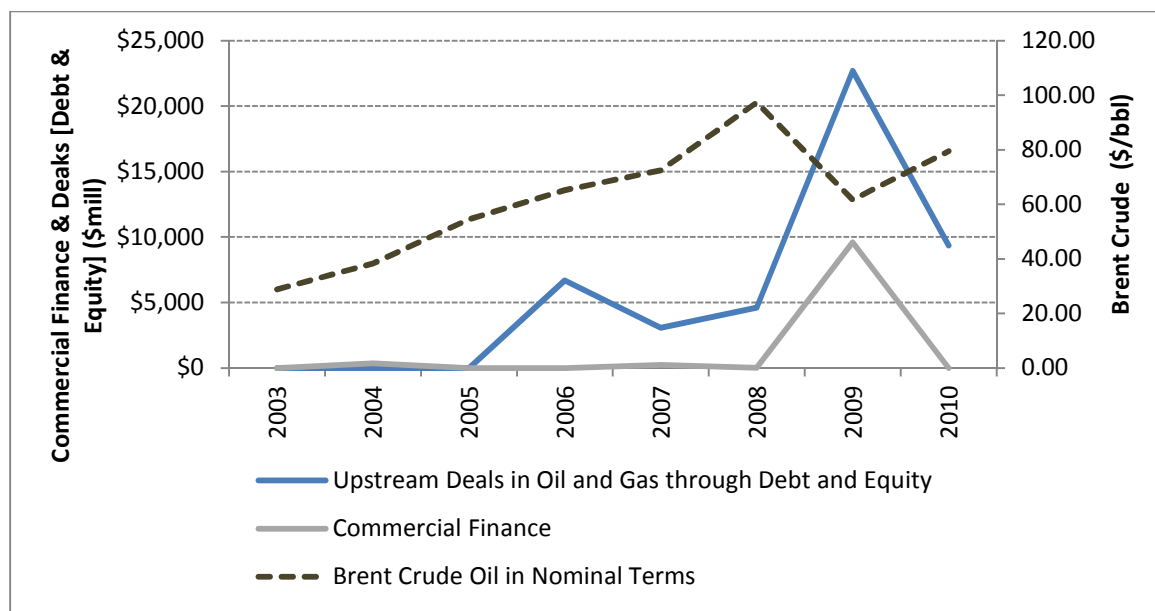


Figure 3: Upstream oil and gas deals; and commercial finance

Includes data for: Algeria, Angola, Cameroon, Democratic Republic of Congo, Egypt, Gabon, Ghana, Cote D'Ivoire, Libya, Morocco, Mozambique, Nigeria, South Africa, Sudan, Tanzania, Tunisia and Uganda

Source: Credit Suisse (2011) and Standard Bank (2011) and PLS Derrick M&A database (2012), BP Statistical Review (2012)

Development finance tends to mimic the deals in the industry, however, with a lag. Development finance made up approximately 4% of finance for the deals undertaken during its peak. The lag in the time series in development finance from the peak deal period may suggest that the approval and assessment through Development Finance Institutions (DFIs) takes approximately a year before the financing is realised. This may be true because proposals which are submitted for development finance are evaluated for alignment towards strategic priorities, evaluability and additionality (Inter-American Development Bank (IDB), 2012; Wetherill, 2010b). Development financiers have to ensure that the project will aid economic development within the region and will provide sustainable returns.

The discussion regarding firms and their dependence of finance leads this paper towards the discussion of access to finance by firms based on their dependence on development finance in the absence of developed equity markets. From the studies conducted, development finance tends to have an inverse relationship to developed capital markets. It is likely to be the case in

this study. Several papers advocate for the changes in the structure of DFIs to better participate in financing schemes but this suggestion stems from economies that have developed and competing capital markets. This is not the case in Africa, thus, the relationship between the sustainable participation of firms given the levels of development and external financing is supported by the literature which also cements the need for further analysis of domestic equity markets to contend with these forms of financing.

Chapter 3: Data and Research Methodology

3.1 Measuring the Sustainable Participation of Small Firms

The empirical analysis is conducted as follows: small independent firms in the oil and gas industry are identified for seven selected countries in Africa. Small independent firms are private and public firms with a market capitalisation of less than USD 20 billion¹¹. Their average licensed interest in oil and gas blocks in the selected countries will be averaged to represent current participation. Equity market information for the selected countries is identified. Equity market development will be represented by market capitalisation and volumes trades. The financing portion of the analysis will be represented by development finance, external finance through upstream deals and commercial loans for the oil and gas industry.

The empirical analysis is done using a two-pronged approach. Two hypotheses will be tested: the first test addresses the sustainable participation of small independent firms; the second tests the same parameters against large integrated firms. A comparative analysis of the results is used to address the differences in the findings.

The defining question is how do we test the sustainable participation of firms? Sustainable participation is analysed by using the proxy of licensed interest to test if there are significant relationships between equity markets, development finance and that of external finance. If there is a significant relationship towards finance in general, then the test can be taking a step further. The next tranche of analysis is to observe whether large firms display a similar trend in the levels of significance indicated by the results. If larger firms display a stronger relationship towards external financing than that of small firms, it stands to reason that external financing drives a fundamental element in a small firm's ability to finance projects and for small firms to increase their licensed interest in oil and gas blocks. Thus, the sustainable participation of small firms given the level of access to financing is compromised.

¹¹ Which is less than the average market capitalization of large integrated firms (Exxon Mobil, Royal Dutch Shell, Chevron, BP, Total, Conoco Phillips, ENI) operating in Africa. See appendix for more information.

The following hypotheses are tested:

3.1.1 Small Firm Participation

Null hypothesis for small firms, Hypothesis 0_a:

$$\begin{aligned}\beta_2 \text{ (development finance coefficient)} &= 0, \\ \beta_1 \text{ (equity market development coefficient)} &= 0\end{aligned}$$

Hypothesis 1: participation by small independent oil and gas firms is not sustainable at the level of development finance and domestic equity markets in Africa

The empirical analysis is tested using the following cross-section regression analysis.

$$FP_{j,k} = \alpha + \beta_0 FP_{j,1} + \beta_1 EMD_j + \beta_2 DF_j + \beta_3 IG_{j,k} + e_{j,k}$$

3.1.2 Large Firm Participation

Null hypothesis for large firms, Hypothesis 0_b:

$$\begin{aligned}\beta_2 \text{ (external finance coefficient)} &= 0, \\ \beta_1 \text{ (equity market development coefficient)} &= 0\end{aligned}$$

Hypothesis 2: participation by large integrated oil and gas firms is not sustainable at the level of development finance and domestic equity markets in Africa

The empirical analysis is tested using the following cross-section regression analysis.

$$FP_{j,k} = \alpha + \beta_0 FP_{j,2} + \beta_1 EMD_j + \beta_2 EF_j + \beta_3 IG_{j,k} + e_{j,k}$$

The cross-section model represents firm participation (FP) in country j for large (k = 1) or small firms (k = 2). The dependent variable, is a function of its competitors' participating interest, equity market development (EMD) in country j, development finance (DF) given to firms in

country j from DFIs, external finance (EF) in the form of upstream mergers and acquisitions and commercial finance in country j and a firm-industry control variable, industry growth (IG), represented by a ratio of production and licensed blocks in country j for firms k .

3.2 Data Analysis

Cross-sectional data is used as the dataset. The data are organised according to countries and is separated according to small independent and large integrated firms per country.

3.2.1 The Sample

The nine countries formed the initial sample size which was segmented into regions, namely, North Africa (Egypt, Tunisia), West Africa (Nigeria, Ghana, Cote D'Ivoire and Cameroon, Gabon), East Africa (Tanzania), and Southern Africa (South Africa). However, Gabon and Cameroon had to be excluded from the sample based on the lack of equity market data. The sample size was then reduced to seven countries. Even though South Africa is not a major oil and gas producer relative to the rest of the continent, it has one of the most developed equity markets in Africa and would be interesting to use in the sampled data. The countries selected were based on the data available for equity markets. Although there are many more countries in Africa with stock exchanges, not all have the data available. The second selection process involved choosing countries where oil and gas was prevalent. This resulted in the seven countries selected as shown in Table 2.

Table 2: Sample selection

Region	Country	Market capitalisation as a percentage of GDP	Production ('000 boe/d)	Data sample
		2009	2010	
Eastern Africa	Kenya	36	-	-
	Tanzania	-	14	-
	Uganda	-	-	-
	<i>Average</i>	<i>36</i>	<i>14</i>	
Northern Africa	Egypt	48	1825	sample

	Morocco	69	1	sample*
	Tunisia	23	133	sample
	<i>Average</i>	<i>47</i>	<i>653</i>	
Southern Africa	Botswana	34	-	-
	Malawi	-	-	-
	Mauritius	55	-	-
	Namibia	9	-	-
	South Africa	246	34	sample
	Swaziland	-	-	-
	Zambia	-	-	-
	Zimbabwe	-	-	-
	<i>Average</i>	<i>86</i>	<i>34</i>	
Western Africa	Cote D'Ivoire	20	70	sample
	Ghana	16	2	sample
	Nigeria	20	3150	sample
	<i>Average</i>	<i>21</i>	<i>1074</i>	

* Data excluded based on low production

Source: Allen, Otchere and Senbet (2011) and Woodmackenzie (2013)

Note: data from 2009 is used because it was the last complete set of data available. Production in 2010 was used because Ghana started producing oil from this year. Oil production increased substantially in 2011. Countries excluded did not have data available.

3.2.2 Model to Measure Firm Participation Sustainability

The firm-level data contains the average licensed interest in oil and gas blocks of the identified firms per country as at 2012. This is a proxy for sustainable firm participation. A better variable would have been time series data for each firm and their growth in licensed interest over time. However, this data is not easily available for use in this study; therefore, licensed interest as at 2012 will need to be used. This dataset is a fair indication of how firms in different countries participate in oil and gas development and production based on the number of firms active in licensed blocks.

3.2.3 Country-Level Indicators of Equity Market Development

The equity market data is represented by the average equity market capitalisation per Gross Domestic Product (GDP), the volume traded per GDP and the turnover ratio calculated as the volume traded over market capitalisation using aggregated data for the period between 2000 and 2010.

3.2.4 Financing

The development financing element consists of development finance offered over the period between 2000 and 2010 where the finance is scaled by GDP. The external financing element in the form of commercial loans and upstream deals in Africa (in exclusion of development finance) are also including and are scaled by GDP. Development finance data was sourced from DFIs namely, International Finance Corporation (IFC) and the African Development Bank (AfDB).

3.2.5 Oil and Gas Industry Growth Indicators

The control variables which are indicators of the growth in the oil and gas industry are represented by the oil and gas production in the by the firms in the country scaled by the total number of licenses held by the firms in countries analysed. The data is tallied for the period of 2003 and 2012. Table 3 and Table 4 describe the variables used in for sampled countries.

Table 3: Definition of variables

Variable	Definition
Small firm	Independent private and public firm with upstream oil and gas licensed interests in development and production activity. Firms in exploration licenses are excluded because development financing usually is sourced from the development of the field. This variable includes both operators and non-operators
Large firm	Integrated private and public firm with interests in the full value chain of oil and gas operations ie upstream, midstream and downstream interests. The variable indicates the firm's upstream licensed interests in development and producing assets
Participating interest	Licensed interest in upstream blocks for firms in development and production
Licensed blocks	The number of development and producing oil and gas blocks that a firm has an equity interest in

Table 4: Data description

Variable	Units	Description	Data period	Source	Countries sampled
Production Oil and gas	barrel oil equivalent per day ('000 boe/d)	Oil and gas production of 1P and 2P reserves (proved: 90% probability of commercial recovery and probable: ~50% probability of commercial recovery given current commodity prices and technology)	2002-2013	Woodmackenzie (2013)*	7
Licensed interest	%	Equity interest as per the licensed terms in international oil and gas agreements for oil and gas assets (exploration, development and production)	2002-2013	Woodmackenzie (2013)*	7
Number of small firms	#	Independent oil and gas firms with licensed interests in oil and gas development and production	2002-2013	Woodmackenzie (2013)*	7
Licensed blocks	#	The quantity of blocks held by firms in licensed blocks in a particular country	2002-3013	Woodmackenzie (2013)*	7
Number of large firms	#	Integrated oil and gas firms (“Majors”) with licensed interests in oil and gas development and production. It excludes some National Oil Companies (NOCs) not listed on stock exchanges and only NOCs with a large market capitalisation are included (ie > ~20 USD billion)	2002-2013	Woodmackenzie (2013)*	7
Market Capitalisation/GDP	Ratio	Value of listed shares to GDP, calculated using the following deflation method: $\{(0.5)*[F_t/P_{et} + F_{t-1}/P_{et-1}]\}/[GDP_t/P_{at}]$ where F is stock market capitalization, P_e is end-of period CPI, and P_a is average annual CPI	2002-2009 (some data ends 2007)	Beck Demirgun-Kunt Levine (2010)	7
Volume Traded / GDP	Ratio	Total shares traded on the stock market exchange to GDP	2002-2009 (some data ends 2007)	Beck Demirgun-Kunt Levine (2010)	7
Turnover ratio	Ratio	Ratio of the value of total shares traded to average real market capitalization, the denominator is deflated using the following method: $T_t/P_{at}/\{(0.5)*[M_t/P_{et} + M_{t-1}/P_{et-1}]\}$ where T is total value traded, M is stock market capitalization, P_e is end-of period CPI P_a is average annual CPI	2002-2009 (some data ends 2007)	Beck Demirgun-Kunt Levine (2010)	7
External Finance: commercial finance	USD million (nominal)	Commercial and investment finance in upstream oil and gas in Africa	2004-2010	Credit Suisse and Standard Bank (2012)	7 (5 financed)
External Finance: upstream oil and gas debt and equity deals	USD million (nominal)	Equity and debt financing by the companies that participated in the acquisition of upstream oil and gas assets in Africa. Mergers and Acquisition (M&A) deals are relevant because companies are acquiring a stake in	2005-2010	PLS Derrick M&A database (2012)*	7

		upstream exploration, development or production with, usually, small firms selling their interest.			
Development finance	USD million (nominal)	Finance offered to upstream oil and gas firms in Africa	2003-2010	International Finance Corporation (IFC, 2011), African Development Bank (Wetherill, 2010b)	7 (5 financed)

*Proprietary

Note:

1. Data for Nigeria is in exclusion of development and production in the Joint Development Zone (JDZ) between Nigeria and Sao Tome Principe.
2. Some National Oil Companies (NOCs) are excluded from the dataset for large firms because the role of NOCs in investing in blocks worldwide is only at its genesis and has seen remarkable growth recently, therefore, only a few publically listed NOCs with substantial market capitalisation are included

3.3 Problems with the Data

The study excludes some countries that have significant oil and gas interests like Algeria, Sudan, Libya, Cameroon, Gabon and Mozambique because of insufficient or fragmented data. This limits the sample size and erodes substantial indicators within the oil and gas industry. The small independent oil and gas firms are numerous and some firms may have ceased to exist in the market based on economic and financial forces. The evolving nature of some firms exists but would not alter the findings from the firms used in a substantial manner. Different sources are used to obtain the data, however, the analysed parameters i.e. average licensed interest, and equity market development was obtained from consistent sources.

The model constructed may be subject to omitted variable bias; however, concerns over the form should not be substantial. The control variable included attempts to rectify firm-industry characteristics which aim to reduce omitted variable bias.

The data for commercial finance offered to upstream oil and gas activity in Africa ranged in the billions. However, because there was not a clear allocation to the country where the financing for the firms was directed, most of the financing which ranged in the billions (USD) had to be excluded.

Chapter 4: Analysis of Findings

The analysis conducted for the seven sampled countries reaped the findings below. The findings address the parameters of firm participating interest, equity market development and external financing.

4.1 Descriptive Statistics

From the seven countries that are analysed, the descriptive statistics are calculated using the allocation per country. Table 5 indicates very low liquidity as an indicator of equity market development. This will have a limited effect on firm participation as a source of finance.

Table 5: Descriptive statistics for equity market development

	<i>N</i> (countries)	<i>Mean</i>	<i>Standard</i> <i>Deviation</i>	<i>Minimum</i>	<i>Maximum</i>
Market capitalisation as a percentage GDP	7	55%	80%	5%	231%
Volume traded as a percentage GDP	7	23%	47%	0%	128%
Turnover ratio	7	0.148	0.166	0.016	0.472

Development finance contributes a small percentage in the financing activity in oil and gas activity. Of the countries sampled, development finance contributed a mean of 9% as compared to the commercial and investment finance provided to four of the sampled countries to upstream oil and gas activity. Compared to upstream equity and debt merger and acquisition deals, development finance contributed ~7% to oil and gas activity, as shown in Table 6.

Table 6: Descriptive statistics for development and external finance

	<i>N</i> <i>(countries)</i>	<i>Mean</i>	<i>Standard</i> <i>Deviation</i>	<i>Minimum</i>	<i>Maximum</i>
Development finance (USD million, nominal)	5	232	348	1	844
Commercial and Investment finance in oil and gas in Africa (USD million, nominal)	4	2547	4305	230	9000
Upstream oil and gas deals in Africa (debt and equity financing, USD million, nominal)	7	3442	5196	6	14068

Small and large firms need to be compared based on their respective characteristics. Small firms make-up a mean production rate of 28% of large firm production in barrel oil equivalent per day (boe/d)¹². Small firms hold more licensed blocks than large firms and this is attributed to the fact that their participating interest in blocks is small. This is indicated by their participating interest as a function of the number of participating firms. So as a ratio of their means, license participating interest as a function of the number of participating firms is 1.13% and 9.6% for small and large firms respectively. Therefore, large firms have fewer firms participating with a larger mean participating interest, whereas, small firms have many firms participating with a smaller mean participating interest. This is shown in Table 7.

Table 7: Descriptive statistics for participating firms

	Small firms				
	<i>N</i> <i>(countries)</i>	<i>Mean</i>	<i>Standard</i> <i>Deviation</i>	<i>Minimum</i>	<i>Maximum</i>
Production ('000 boe/d)	7	958	1521	49	4330
Licensed blocks	7	122	100	22	273

¹² Barrel oil equivalent (boe) includes both oil and gas production

Licensed Interest (%)	7	52	10	41	71
Number of participating firms	7	46	42	18	133
Large firms					
	<i>N</i> <i>(countries)</i>	<i>Mean</i>	<i>Standard</i> <i>Deviation</i>	<i>Minimum</i>	<i>Maximum</i>
Production ('000 boe/d)	7	3399	5783	0	13936
Licensed blocks	7	50	72	5	174
Licensed Interest (%)	7	48	18	24	77
Number of participating firms	7	5	3	3	10

Before the regression results are analysed, correlation analysis needs to be understood to determine the relationship between the different variables under analysis as shown in Table 8. Small and large firm participation are highly correlated. Large firms have greater correlation with equity market development than small firms. This may infer the higher dependence on equity markets by large firms than small firms.

External finance is negatively correlated to small and large firms, meaning that if participating interest increases, external finance as a source is reduced. Cost of external financing and access to internal cash flows may assist in explaining this phenomenon - although this explanation is not conclusive. Development finance has a very low correlation to both small and large firms based on its limited financing.

4.2 Model Results

Cross-country regression analysis was conducted for small and large firms respectively. The industry growth variable proved to be insignificant in both sets of data as well as the commercial

financing component, thus, both variables were excluded from the regression analysis. The results are tabulated in Table 9.

4.2.1 Small Firm Participation

The small firms' participation was analysed as a function of large firms' license interest, equity market development and development finance.

The five variables explain 99% of the behaviour of large firms with participating interest. R-squared is significant as Significance F is within the 5% level of significance.

All the variables are within the 5% level of significance (P-values >0.05 and 95% confidence interval contains zero). The variables provide explanatory power of the participating interest of small firms. If a large firm's interest increases by 1%, a small firm's participating interest would reduce by 6.8%. This is a significant effect. Equity market development is also an important factor in the behaviour of a small firm's participating interest. If market capitalisation as a percentage of GDP increases by 1%, a small firm's participating interest is affected by a reduction of 3.3%. This can be explained by the bias of large firms on the stock exchange. However, if liquidity is increased, based on the volume traded as a percentage of GDP, a small firm's participating interest can increase by 12.2%. This may be explained by access to finance by large firms (even though limited) which assists small firms to obtain small participating interest in the new acquisition of oil and gas blocks. Development finance seems to have the least effect on a small firm's participating interest. This could be explained by the already limited funding available from Development Finance Institutions (DFIs) and the lack of access by small firms to different forms of financing.

Therefore, the null hypothesis is rejected and hypothesis 1 is accepted. Therefore, small firm participation is not sustainable at the current level of finance and equity market development in Africa

4.2.2 Large Firm Participation

The large firm participation was analysed as a function of small firm license interest, equity market development and upstream deals.

The five variables explain 99% of the behaviour of large firms with participating interest. R-squared is insignificant as Significance F is outside the 5% level of significance, therefore, as much as R-squared is high, R-squared could be zero yielding zero explanatory power from the five variables.

Small firm license interest, equity market development and external finance are outside the 5% level of significance (P-values >0.05 and 95% confidence interval contains zero). Therefore, all variables fail to provide any explanatory power of the participating interest of large firms. This could be explained by financing through internal cash flows for the companies that form part of this sample.

Therefore, the null hypothesis is accepted. The hypothesis that large firm participation is sustainable at the level of finance and equity market development in Africa

There does not seem to be a problem with multicollinearity in the results for the small firm as demonstrated by low P-values. For large firms, only small firm participation is highly correlated which may pose a multicollinearity problem. The variables together provide explanatory power but multicollinearity causes a problem in allowing the regression to decide which variables provide the explanation.

Table 8: Correlation analysis between the measure of firm participation and sources of finance

		Young firms' participation	Old firms' participation	Equity Market Development			External finance: deals	Development Finance	Industry growth	
		<i>License interest per small firm</i>	<i>License interest per large firm</i>	<i>Average Market capitalisation / GDP</i>	<i>Average volume traded / GDP</i>	<i>Average turnover ratio</i>	<i>Total upstream oil and gas M&A deals</i>	<i>Total development finance</i>	<i>Average production per block (small firms)</i>	<i>Average production per block (large firms)</i>
Young firms' participation	<i>License interest per small firm</i>	1.00								
Old firms' participation	<i>License interest per large firm</i>	0.93	1.00							
Equity Market Development	<i>Average Market capitalisation / GDP</i>	0.75	0.88	1.00						
	<i>Average volume traded /GDP</i>	0.77	0.91	0.99	1.00					
	<i>Average turnover ratio</i>	0.52	0.72	0.93	0.93	1.00				
External finance: deals	<i>Total upstream oil and gas M&A deals</i>	-0.40	-0.36	-0.26	-0.25	-0.06	1.00			
Development Finance	<i>Total development finance</i>	0.16	-0.15	-0.24	-0.26	-0.29	0.02	1.00		
Industry growth	<i>Average production per block (small firms)</i>	-0.52	-0.59	-0.18	-0.27	-0.08	0.12	0.07	1.00	
	<i>Average production per block (large firms)</i>	-0.66	-0.49	-0.21	-0.21	0.11	0.82	-0.24	0.38	1.00

Table 9: Regression analysis results

Small firms						
<i>Observations</i>	7					
<i>R-squared</i>	100.0%					
<i>Significance -F</i>	0.0024					
	Small firms' participation	Old firms' participation	Equity market development			Development finance
		License interest per large firm	Average Market capitalisation as a percentage of GDP	Average volume traded as a percentage of GDP	Average turnover ratio	Total development finance
	Intercept					
<i>Coefficient</i>	2.015	-0.068	-0.033	0.122	-11.667	0.001
<i>t Stat</i>	102.458	-31.751	-68.644	86.855	-119.248	191.997
<i>P-value</i>	0.006	0.020	0.009	0.007	0.005	0.003
<i>Lower 95%</i>	1.765	-0.095	-0.039	0.105	-12.910	0.001
<i>Upper 95%</i>	2.265	-0.041	-0.027	0.140	-10.424	0.001
Large firms						
<i>Observations</i>	7					
<i>R-squared</i>	99.1%					
<i>Significance -F</i>	0.1567					
	Large firms' participation interest	Young firms' participation	Equity market development			External finance
		License interest per small firm	Average Market capitalisation as a percentage of GDP	Average volume traded as a percentage of GDP	Average turnover ratio	Total upstream oil and gas M&A deals (equity and debt)
	Intercept					
<i>Coefficient</i>	7.303	1.319	-0.183	0.535	-31.866	0.000025
<i>t Stat</i>	1.765	0.568	-1.825	2.413	-1.157	-0.136
<i>P-value</i>	0.328	0.671	0.319	0.250	0.454	0.914
<i>Lower 95%</i>	-45.262	-28.216	-1.457	-2.284	-381.890	-0.002
<i>Upper 95%</i>	59.869	30.855	1.091	3.355	318.157	0.002

Chapter 5: Conclusion

The study was directed at understanding the relationship between the sustainable participation of small independent firms in the oil and gas industry and domestic access to finance. The study embarked to determine whether there is a trend towards the sustainable participation of small firms where development finance exists in consideration of the level of development of domestic equity markets in the African states that have oil and gas activities.

There study has confirmed that there is a relationship between different sources of finance and small to large firm participation. The study concludes that the sampled large firms are less reliant on finance from debt and equity sources and it can be inferred that data from their internal cash flows assists in providing the required finance for development and production activity. Small firms are more heavily reliant on different sources of finance even though their access to domestic finance is limited.

The question that needed to be answered: is participation by small independent oil and gas firms sustainable given the level of development finance and the state of domestic equity markets in Africa? The answer to this question is no. The sustainable participation of small firms is compromised by the lack of development of equity markets and the level of development finance available.

There is dependence between small firm and large firm participation, their participation is interrelated. If there is growing license interest participation by large firms, the license interest of small firms tends to reduce. If there is growing license interest by small firms, the license interest of large firms tends to increase. This can be explained by the ease of access to sources of finance by large firms and less so by small firms.

The greater the development of equity markets as volume traded as a percentage of GDP (liquidity), the greater the license interest participation by large firms over small firms. Equity

market development is a significant parameter in the assessment of firm participation in oil and gas activity. The lack of development limits firm participation.

Development finance still plays a limited role as a source of finance. Even though domestic sources of finance are limited, large firms are able to tap into alternate sources of finance and small firms remain restricted in the amount of finance that they are able to source. The cost of external finance may be considered costly for small firms; therefore, if domestic forms of finance through the development of equity markets do not progress, the sustainability of small firm participation in oil and gas activity in Africa will remain confined to small levels of interest.

An extension to this study could be the analysis of syndicated debt in the form of project finance on the energy sector as a whole. A study of this nature would allow for a greater sample of African countries and a greater scope of infrastructure projects.

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Appendix**Table 10: Market capitalisation of integrated oil and gas companies (large firms) with interests in Africa**

MARKET CAPITALISATION	<i>USD billion</i>	<i>Euro billion</i>	<i>Exchange rate</i>	<i>Stock Exchange</i>
Ente Nazionale Idrocarburi (ENI)	49.05	64.25	1.31	Italy
Exxon Mobil	405.64			New York
Royal Dutch Shell	208.00			New York
Chevron	221.00			New York
British Petroleum (BP)	129.00			New York
Total	117.00			New York
Conoco Phillips	69.00			New York
Sasol	28.00			New York
Statoil	77.00			New York
Repsol	25.00			New York
British Gas (BG)	59.00			New York
GDF Suez	44.00			Over the Counter (OTC) USA
Lukoil	54.00			Over the Counter (OTC) USA
Average	114.28			

Source: Bloomberg (February, 2013)