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MULTINATIONAL ENTERPRISES AND ACCESS TO ELECTRICITY IN DEVELOPING COUNTRIES

THE CASE OF SUB-SAHARAN AFRICA

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"University is not a place of professional education. Universities are not intended to teach the knowledge required to fit men for some special mode of gaining their livelihood. Their object is not to make skilful lawyers, or physicians, or engineers, but capable and cultivated human beings […].

Men are men before they are lawyers, or physicians, or merchants, or manufacturers; and if you make them capable and sensible men, they will make themselves capable and sensible lawyers or physicians. What professional men should carry away with them from an University, is not professional knowledge, but that which should direct the use of their professional knowledge, and bring the light of general culture to illuminate the technicalities of a special pursuit. Men may be competent lawyers without general education, but it depends on general education to make them philosophic lawyers who demand, and are capable of apprehending, principles, instead of merely cramming their memory with details."

(Inaugural address delivered to the University of St. Andrews by John Stuart Mill, 1867)

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ABSTRACT

In the last years, the world is facing profound and escalating challenges, which have generated a growing pressure on multinational enterprises (MNEs), from local and international institutions and, civil society, to act as operators of development. The thesis joins this debate and focuses on a specific mechanism of development, i.e., local population's access to electricity, and on a specific developing region, so far under-studied by scholars, i.e., sub-Saharan Africa. Specifically, it addresses the following overarching research questions: *Does the presence of MNEs improve access to electricity for local population in developing countries? What is the overall effect on sustainable development? Does the improvement of access to electricity by means of MNEs occur in any case or only under particular contextual and strategic conditions?.* In replying to these questions, the thesis demonstrates that MNEs raise the electrification of developing countries if they operate in contexts with weak formal and informal institutions and come from countries with similar institutional fragilities. Further, MNEs are found to foster electrification when the host country is moderately rich and the home country is poor. However, under these conditions the host country's environmental degradation raises. Finally, the thesis shows that based on the motivations that drive MNEs' engagement in the development of electricity infrastructure, effects on MNEs' performances are different. Namely, if the development of electricity infrastructure is part of the MNEs' political activities, benefits are widely widespread, in terms of economic performance, internal efficiency, access to key resources and, legitimation with a broad set of stakeholders. On the contrary, investments in electricity infrastructure done for social responsibility purposes appear to be less beneficial.

Negli ultimi anni il mondo sta affrontando trasformazioni epocali che hanno generato crescenti pressioni sulle imprese multinazionali (IMs), da parte delle istituzioni nazionali e internazionali e dalla società civile, ad agire come operatori dello sviluppo. Questa tesi vuole partecipare a questo dibattito focalizzandosi su un preciso meccanismo di sviluppo (i.e., l'accesso all'elettricità della popolazione locale), e su una regione in via di sviluppo fino a questo momento limitatamente studiata dal mondo accademico (i.e., l'Africa sub-Sahariana). Nello specifico, questo lavoro cerca di rispondere alle seguenti domande: *Può la presenza di IMs aumentare l'accesso all'elettricità per la popolazione locale dei Paesi in via di sviluppo? Quali sono nel suo complesso gli effetti sullo sviluppo sostenibile? L'aumento dell'accesso all'elettricità ad opera delle IMs avviene sempre o sotto specifiche condizioni contestuali e strategiche?.* Nel rispondere a queste domande, la tesi dimostra che le IMs aumento l'accesso all'elettricità se operano in Paesi affetti da vuoti istituzionali, formali che informali, e se provengono da Paesi con le stesse fragilità istituzionali. Inoltre, le IMs più efficaci nell'aumentare l'accesso all'elettricità sono quelle che operano in Paesi mediamente ricchi e provengono da Paesi poveri, con conseguenze purtroppo negative sulle condizioni ambientali dei Paesi di destinazione delle IMs. Infine, la tesi dimostra che il coinvolgimento delle IMs nello sviluppo di infrastrutture elettriche ha effetti diversi sulle performance di queste aziende in base alle motivazioni che le hanno spinte a fare questo investimento. Nello specifico, se lo sviluppo di infrastrutture elettriche è stato fatto per fini politici, i benefici sulle performance aziendali sono molto grandi e riguardano diverse dimensioni (i.e., performance economiche, efficienza aziendale interna, accesso a risorse strategiche e legittimazione con un'ampia gamma di stakeholder). Al contrario, se l'investimento infrastrutturale è stato fatto per ragioni di responsabilità sociale d'impresa, i benefici sulle performance delle IMs sono più limitati.

SUMMARY

In the last years, the world is facing profound and escalating challenges, such as climate changes, enduring poverty of a few countries, inequality at country and global level, internal, cross-border and cross-region migrations. For decades, the most obvious candidates for coping with these global problems were governments and global institutions, such as the United Nations or the World Bank. These institutions do in fact play a role; nevertheless, the Rio+20 summit emphasized the need for a much wider partnership. Among the partners that could act jointly to address these challenges, multinational enterprises (MNEs) are expected to play a key role, as since the seventies they have been growing in size and capabilities.

This thesis wants to join the wide debate on the MNEs' impact on development by focusing on the local population's access to electricity and on an unique region, i.e., sub-Saharan Africa. On the one hand, the choice of a specific mechanism through which MNEs can act on local development is a strategy to unpack a complex issue and to enable a clearer observation of MNEs' impacts, reducing of the risk of spurious correlations. On the other hand, electricity, with education, health, communication, transportation or water, is not just one of the many industries that may offer a lens through which looking at the role of MNEs. It is a fundamental good (similar to the economic intermediate products à la Buckley and Casson), as without it any social and economic activity is either physically impossible or too expensive. In addition, the choice of sub-Saharan Africa is due to the fact that the region is an unique context that can shed light on the current understanding of the relationship between multinationals and development. In fact, in 2013 more than 30 percent of the population still had no access to electricity. Despite this development challenge and, despite the perception that most of the countries of the region are suffering from political instability and high corruption, sub-Saharan Africa has experienced an unprecedented growth of MNEs' presence in the last ten years, becoming an increasingly attractive place to compete. These positive and negative dynamics makes sub-Saharan Africa a very interesting setting for my thesis.

Namely, the thesis gauges how economic and institutional conditions of the countries of origin and destination of MNEs' investments facilitate the involvement of MNEs in the provision of electricity to local population, presumably through the construction, maintenance and expansion

of infrastructure for the production, transmission and distribution of electricity. In addition, the work studies the outcomes that the involvement of MNEs in the electrification process of developing countries can have on the environment. Finally, it analyzes the motivations of MNEs' engagement in electricity infrastructure projects, and how this affects their performances. For this purposes four papers have been developed, which move from a country (Papers 1,2 and 3) to a firm perspective (Paper 4).

The results of this thesis demonstrate that MNEs raise the electrification of developing countries if they operate in contexts with weak formal and informal institutions and come from countries with a similar institutional fragility. The reason could be that managers already developed at home the ability to deal with a challenging institutional environment, over time in a learning-by-doing manner. In addition, this ability could represent a competitive advantage for MNEs from institutionally weak countries, as it can be strategically exploited to overcome the serious lack of legitimation, whereby these firms generally suffer with their stakeholders.

Looking at the stage of economic development of both home and host country, MNEs are found to foster electrification when the host country has reached a certain level of economic development and the home country is poor. Indeed, poor host countries tend to attract mainly MNEs operating in the extractive industry, which develop a private electricity infrastructure. This is difficult to exploit for welfare services due to their specific characteristics (e.g., they are located in remote areas, or the voltage of power grid does not match with national grid requirements). As consequence, host governments, stocked to its budget constraints, are unable to exploit MNEs' presence for public purposes. On the contrary, host countries at a higher stage of economic development attract MNEs from different sectors and are more able to take advantage from their presence.

However, by raising the access to electricity in the developing countries where they invest, MNEs from poorer countries raise also the environmental degradation of these countries. The reason could be that these firms still have a strong technological disadvantage, compared to firms from rich countries, and adopt limited sustainable business practices, as they are constrained by the economic development of their countries of origin. In addition, as MNEs are more effective in raising the access to electricity in countries affected by institutional voids, it is reasonable to assume that even though the host country has reached a certain level of economic development

its institutions are still weak and ineffective in implementing strong policies for the protection of the environment.

Finally, the thesis shows that, in developing countries, non-market strategies have a large impact on firms' performances. Namely, the implementation of CPA and CSR initiatives is linked to an increase of firm's economic performance, reputation with stakeholders, access to strategic resources and organizational efficiency. However, except that for the dimension of organizational efficiency, the linkages between firms' performances are statistically more significant with CPA.

The strength and novelty of this thesis is that it integrates several debates and contributes to different streams of research. Namely, it contributes to the research on MNEs' impact in host developing countries and their mediating factors; on institutions and provision of collective goods and; on MNEs' legitimation mechanisms. Further, it adds to the research on the environmental consequences of MNEs' presence and economic growth and; research on non-market strategies and their impact on firms' performances.

At the same time, this thesis has important managerial and policy implications for both firms' managers and developing countries' governments. Indeed, an analysis of the conditions that make a private investment effective in terms of energy poverty alleviation and environmental preservation is fundamental to understand which type of MNEs should be attracted and to guide the development and implementation of specific energy policies in each country. At the same time, this thesis also concerns MNEs themselves. In fact, these companies are under constant pressure to continuously increase shareholder returns. In order to achieve this objective, MNEs need to increase their investments in developing countries and participate in their long-term growth and prosperity (Oetzel and Doh, 2009; Gratton, 2014). In this perspective, the enhancement of access to electricity could be a viable strategy to create the conditions for settling-in durable and profitable new business activities in these countries.

CHAPTER 1. INTRODUCTION

In the last years, the world is facing profound and escalating challenges, such as climate changes, enduring poverty of a few countries, inequality at country and global level, internal, cross-border and cross-region migrations. For decades, the most obvious candidates for coping with these global problems were governments and global institutions, such as the United Nations or the World Bank. These institutions do in fact play a role; nevertheless, the Rio+20 summit emphasized the need for a much wider partnership. Among the partners that could act jointly to address these challenges, multinational enterprises (MNEs) are expected to play a key role, as since the seventies they have been growing in size and capabilities (Gratton, 2014)[1,2]. The opportunity of MNEs' involvement has been also emphasized in the 2014 World Investment Report (WIR), released by the United Nations Conference on Trade and Development (UNCTAD), which focused on the contribution that the private sector could make to the 2030 Agenda for Sustainable Development and the related Sustainable Development Goals (SDGs).

The aim of this thesis is to join this debate and investigate the impact of MNEs on a mediator of development, i.e., the local population's access to electricity, with a focus on sub-Saharan Africa. There are several reasons why this topic is worth addressing.

From a general perspective, an analysis of the relationship between MNEs and access to electricity is an input to the wider debate on the impact of MNEs' presence on developing countries, which so far has generated substantial controversy (e.g., Oetzel and Doh, 2009; Narula and Dunning, 2010). A group of researchers affirms that MNEs, mainly through foreign direct investment (FDI), promote economic growth by rising domestic savings, transferring technology

[1] For instance, Lodge and Wilson (2006) use value added defined as the sum of salaries and pre-tax profits, as a measure of the economic size and estimate that, in 2005, fifty-one of the world's one hundred largest economies were not countries, but multinationals.

[2] Based on the estimates of United Nations Conference on Trade and Development (UNCTAD), in 2013, foreign direct investment (FDI) flows to developing countries reached a new high of $778 billion, which accounts for 54 percent of the global inflows. Developing Asia is the region with the highest FDI inflows, with a total amount of $426 billion, followed by Latin America and the Caribbean Sea, which experience a growth of inflow FDI of 6 percent, reaching a peak of $292 billion. Finally, Africa shows a growth rate of 4 percent, and FDI inflows amount to $57 billion, whilst developing Oceania is the only region that remains stable at $3 billion.

and knowledge, increasing domestic competition and stimulating entrepreneurship (Caves, 1976; Teece, 1977). At the same time, other scholars oppose this view, suggesting that MNEs crowd out local firms, introduce inappropriate technologies, constrain potential technology and knowledge spillover, and reduce domestic tax revenues because of the transfer price and profit manipulation (Haddad and Harrison, 1993; De Backer and Sleuwagen, 2003).

The controversy also covers non-economic dimensions, such as environment or human rights (Hubler and Keller, 2010; Giuliani and Macchi, 2013). According to a side of the debate, MNEs increase child labor exploitation, environmental degradation, and the adoption of inadequate safety standards (Clapp and Dauverge, 1993). In other words, developing countries are pushed to reduce their social and environmental standards to attract a higher proposition of MNEs, participating in a global raise to the bottom. However, another group of scholars has criticized this perspective, finding a positive effect of MNEs' presence on the environment and on human and labor rights (Wheeler, 2001; Oetzel and Doh, 2009). Specifically, they find that MNEs directed to developing countries would bring cleaner and more efficient technologies and improve the living conditions through the adoption of voluntary codes of ethical conduct and corporate social responsibility policies (Hubler and Keller, 2010; Giuliani and Macchi, 2013).

There are a few motives for joining the wider debate on the MNEs' impact on development by focusing on the local population's access to electricity. On the one hand, the choice of a specific mechanism through which MNEs can act on local development is a strategy to unpack a complex issue and to enable a clearer observation of MNEs' impacts, reducing of the risk of spurious correlations. On the other hand, electricity, with education, health, communication, transportation or water, is not just one of the many industries that may offer a lens through which looking at the role of MNEs. It is a fundamental, yet complex to provide, good.

Access to electricity is one of those goods and services that ensures large positive externalities to a wide range of communities and industries in terms of economic growth and human well-being (Moser and Nicholas, 2004). In fact, electricity is essential for the provision of clean water, sanitation and healthcare, and gives great benefits to development through the provision of reliable and efficient lighting, heating, cooking, mechanical power, transport and telecommunication services (Fernald, 1999; Destefanis and Sena, 2005). Electricity is an economic intermediate product *à la* Buckley and Casson (1976), i.e., a resource, good or service

necessary for the innovative, productive, and distributive activities of societies because, without it, economic activity is either physically impossible or too expensive in terms of transaction and other costs (North, 1990).

However, in 2013, the International Energy Agency (IEA) estimates that 1.2 billion people (almost one fifth of the world population) do not have access to electricity. More than half is located in sub-Saharan Africa, a fifth in developing Asia (not including China and India), 20 percent in India, and the rest in Latin America and Caribbean Sea and, North Africa and Middle East. For this reason, in 2011, the United Nations General Secretary launched the Sustainable Energy for All Initiative (SE4All) with one of its objectives being the universal access to electricity by 2030.

Indeed, the provision of electricity poses several complexities. It belongs to the group of collective goods, namely those commodities, functions and services that are impure public goods as they are either non-rival and excludable or rival and non-excludable, and are exposed to the risk of underproduction (Boddewyn and Doh, 2011). In particular, electricity provides positive externalities to local communities. Its provision demands the development and maintenance of electricity infrastructure, which is highly sensitive to the country's institutional setting. Thus, infrastructure assets have a high component of sunk investment; entail widespread domestic consumption; and exhibit economies of scale. Suppliers enjoy of market power but at the same time offer a good of political importance and are exposed to the opportunism of governments, and these conditions make infrastructure development a complex form of economic transaction (Levy and Spiller, 1994). For this reason, their provision has historically been assumed by governments, alone or on partnership with profit and non-profit organizations. However, institutions of developing countries may not be able to ensure the provision of collective goods, such as electricity, through the public sector or regulation of local private firms, because of institutional voids (Khanna and Palepu, 1997; Ostrom, 2000). Under these circumstances, MNEs can assist and/or compensate for failing institutions and increase their willingness to create collaborative relationships with profit organizations, non-governmental organizations (NGOs) and governments to provide electricity to local population. In other words, MNEs may be natural candidates for the provision of access to electricity in countries that suffer from failing institutions.

Another motivation for investigating access to electricity as a mechanism through which MNEs may drive a country's development lies in the potentially noxious influence of electricity production and uses on environment. Indeed, the raise of access to electricity can generate negative environmental externalities if systems for its production, transmission and distribution are poorly planned and executed (Ostrom *et al.*, 1993). For this reason, a comprehensive evaluation of MNEs impacts needs to address the multiple effects that accompany the diffusion of access to electricity.

Furthermore, focusing on the access to electricity is a fruitful way to bring to the light the co-presence of different motivations behind MNEs' involvement in the development of developing countries. Namely, MNEs can rely on market and non-market strategies when engaging with the promotion of access to electricity. Thus, electricity is essential for the existence, operation, and performance of MNEs because it is akin to Teece's (1998) complementary assets whose absence may create a choke point in their value chain (i.e., market strategy). In addition, the provision of electricity can be part of the non-market activities that MNEs implement to gain a favorable position in their non-market environments, as well as obtaining permissions from authorities, securing legitimacy from NGOs, or handling relationships with local stakeholders (Boddewyn and Doh, 2011). Understanding the motivations behind MNEs' engagement is a to do step, fundamental to interpret the impact that this engagement has on MNEs' performances.

In sum, the research presented in this thesis intends to offer a theoretical and empirical contribution to scholarships on the role of MNEs in development, by investigating how MNEs activate a powerful yet complex development mechanism, i.e., the access to electricity. Further, along with the impact of MNEs, the thesis studies the contextual conditions and strategies which govern the impact and involvement of MNEs and the sustainability trade-offs which the engagement of MNEs in electricity diffusion generates . To this purpose, this work integrates several research perspectives that so far have rarely talked to each other. Namely, debates on institutional arrangements for the provision of collective goods (North, 1990; Levy and Spiller, 1994; Ostrom, 2000; Henisz, 2002); MNE behavior in the presence of institutional voids (Kostova and Zaheer, 1999; Khanna and Palepu, 1997; Boddewyn and Doh, 2011); MNEs' market and non-market strategies in developing countries (Hillman et al., 2004; Kolk, 2016) and; the relationship

between the three pillars of sustainable development, i.e., economy, society and environment (Dinda, 2004; Zeng and Eastin, 2012; Rezza, 2014).

In pursuing this research objective, the thesis focuses on a particular region, i.e., sub-Saharan Africa, which so far has received less attention than it deserves. In 2013 more than 30 percent of the population still had no access to electricity (IEA, 2014). There are several reasons behind this serious shortage. Among them, the most important is the reduction in infrastructure investments and maintenance in the last third of the 20th century, caused by declining receipts of state revenues arising from the commodity price fall of the 1970s, by political and economic instability, by rising debt, and by weak economic performances (Robbins and Perkins, 2012). Furthermore, most of the infrastructure stocks of the region are still heritage of colonial period and are the result of a productive structure composed by coastal cities connected inland, for the extraction, treatment and distribution of raw materials, which do not represent anymore the real demand of infrastructure (Escribano *et al.*, 2008). Finally, the lack of direct attention on the importance of infrastructure in meeting development objectives in the United Nations Millennium Development Goals (MDGs) has further delayed the underpinning of focal investments[3]. Despite this development challenge and, despite the perception that most of the countries of the region are suffering from political instability and high corruption, sub-Saharan Africa has experienced an unprecedented growth of MNEs' presence in the last ten years, becoming an increasingly attractive place to compete (UNCTAD, 2014). These positive and negative dynamics makes sub-Saharan Africa a very interesting setting for my thesis.

This cover essay is organized as follows. Chapter 2 reports the development of the research questions. Chapter 3 shows the main disciplinary and methodological challenges faced to reply to these research questions. Chapter 4 briefly summarizes the four papers composing the thesis. Chapter 5 presents the main contributions and impacts of the thesis, and Chapter 6 offers

[3] This lack of direct attention of the Millennium Development Goals (MDGs) to electricity services and infrastructure has been overcome by the seventh and the ninth Sustainable Development Goals (SDGs), released by the United Nations in autumn 2015. Namely, the seventh SDG aims to endure access to affordable, reliable, sustainable and modern energy for all, while the ninth aims to build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation (See: https://sustainabledevelopment.un.org/?menu=1300 Accessed on the 1st September 2016).

suggestions for future research developments. Finally, Annex contains the final manuscript of the papers that compose the thesis.

CHAPTER 2. RESEARCH QUESTIONS

When talking about development, we have to talk about electricity (Dinkelman, 2011). A lasting, inclusive and efficient use and availability of electricity is a fundamental driver for economic growth and social development (Haines *et al.,* 2012). Without access to electricity, people spend a great deal of time and personal energy on basic subsistence activities rather than on earning money. In addition, lack of electricity is closely correlates with many indicators of poverty, such as poor education, inadequate health care and hardships imposed on women and children (UN WEHAB Working Group, 2002).

In the last forty years, scholars widely investigated the relationship between electricity consumption and economic growth suggesting that electricity is a primary source of value because other factors of production, such labor and capital, cannot do without electricity; therefore, all production activities and many consumption activities involve electricity as an essential input (e.g., Paul and Bhattacharya, 2004). Most of the empirical literature in this field investigates the nexus between electricity consumption and economic growth by testing the existence of causality linkages between the two dimensions and their directions, in a bivariate context, i.e., Granger causality and reverse causality tests (Granger, 1969). There are cases in which causality is found to run from economic growth to electricity consumption (Masih and Masih, 1996). In other cases, causality runs in the other way around, from electricity consumption to economic growth (Asafu-Adjaye, 2000; Lee, 2005). Finally, there are cases where causality runs in both directions, confirming how interweaved these two dimensions are (Paul and Bhattacharya, 2004). Last but not least, electricity is not only a crucial element for economic growth, but also for social development (WB, 2000). Raising the availability, affordability and reliability of electricity is crucial for poverty eradication, amelioration of health condition and raise of literacy rate (Burney, 1995; Pachauri and Spreng, 2003).

Availability, affordability and reliability of electricity strongly depends on the level of development of infrastructure assets and services necessary for its production, distribution and transmission. For this reason, notion of development is closely associated to modernized and

modernizing infrastructure (Hulten, 1996; Fay *et al.*, 2005). For instance, Hulten (1996), in comparing East Asia and Africa economic growth, finds that an efficient use of infrastructure stocks account for 40 percent of the difference in the economic growth rate. Calderòn and Servén (2004) discover a positive impact of infrastructure stocks on economic growth and a decline in income inequality when higher infrastructure quantity and quality are present. Finally, Fay *et al.* (2005), demonstrate that infrastructure assets play a crucial role in reducing infant mortality and malnutrition rates.

The provision of extensive and reliable electricity infrastructure depends on several factors, which generally varies across countries. Among these factors, nevertheless, some commonalities can be identified. Namely, the level of economic and institutional development of the country (Robbins and Perkins, 2012). Talking about country's institutional environment, nevertheless, means talking not only about the government's political stability, administrative capabilities, credibility of regulatory system and judicial independence in developing and/or regulating large-scale infrastructure (Bergara *et al.,* 1998). It means also talking about the ability of local/informal institutions (e.g., communities or NGOs) in self-organizing collective actions for the introduction and maintenance of small-scale infrastructure assets (North, 1990; Ostrom, 2000).

In the past forty years, the serious public sector's budget constrains combined with lack of effective and stable institutions have undermined developing countries' ability to provide the required electricity infrastructure, deeply threatening their development opportunities (Robbins and Perkins, 2012). This has motivated other actors (e.g., the private - either profit or nonprofit – sector or interest group coalitions) to intervene (Boddewyn and Doh, 2011; Buckley and Boddewyn, 2015). Among those actors, this thesis focuses on MNEs.

Indeed, in the last fifteen years the recent rapid economic growth and positive economic prospects of several developing countries have attracted many MNEs from all over the world. This has generated a growing pressure on MNEs, from local, international institutions and civil society, to act as operators of development, through the construction and/or financing of infrastructure assets, particularly in electricity generation and supply, telecommunications, ports, rails and airports (Araya *et al*., 2013). In studying this phenomenon, the thesis addresses the following overarching research question: *Does the presence of MNEs improve access to electricity for local population in developing countries? What is the overall effect on sustainable*

development? Does the increase of access to electricity by means of MNEs occur in any case or only under particular contextual and strategic conditions?

For replying to this question, three sub-research questions have been formulated with the aim to fully understand the phenomenon and their consequences on both MNEs and developing countries.

First, this work takes into account that there are two factors that can significantly mediate the impact of MNEs on the access to electricity, i.e., the level of country's economic development and the level of country's institutional development. This is true for both, the country of destination of MNEs' investment (i.e., host country) and for the country of origin of the MNE (i.e., home country). Firms' organizational structures, policies, and practices, indeed, tend to reflect the institutional and economic environment in which they have been established (Zaheer, 1995). Under this perspective, also the characteristics of MNE's home countries can significantly affect their ability to impact on the access to electricity of the host country, as they define managerial business practices and MNEs' ability to understand and correctly interpret local requirements, as well as the extent of necessary adjustments (Kostova and Zaheer, 1999; Cuervo-Cazurra and Genc, 2008; Narula and Kodiyat, 2016).

The first sub-research question addressed by this thesis then states as follows.

> *RQ1. Which factors do mediate the impact of MNEs on the access to electricity of local population living in developing countries*?

By enhancing the access to electricity in developing countries, MNEs do not only impact on their socio-economic development, but also on their environmental quality. Specifically, following the framework developed by Antweiler *et al*. (2001), MNE's presence can have three effects: scale, composition and technique effects.

The scale effect simply measures the increase of environmental degradation when MNEs raise access to electricity and the economy scales-up (Hübler and Keller, 2010).

The composition effect represents a structural shift in the economic activity when the access to electricity raises, which can affect either negatively or positively the environment. The sign depends on the sector specialization of the country. Specifically, according to the pollution haven hypothesis, in low-income countries, the environmental regulation is weak and this may attract

MNEs from more polluting industries, raising environmental degradation (Cole and Elliott, 2005; Rezza, 2014). Coherently with the Environmental Kuznets Curve studies, nevertheless, environmental degradation can be expected to follow an inverted-U relationship with economic development and its determinants, including investments from MNEs (Roberts and Grimes, 1997; Dinda, 2004). As MNEs' presence increases and the country is electrified, countries progress from cleaner stages of earlier economic development, i.e., agricultural specialization, to more polluting activities related to heavy industries, to a cleaner economy related to light industry and service specialization. Since heavier industries are more harmful to the environment, this implies a positive composition effect for countries moving from low income to medium incomes. Later in the development process, activities move from the industry to the service sector or from the heavy to the lighter industry. As the latter is more benign, this means a negative composition effect (Hübler and Keller, 2010). In addition, at this stage of development, negative composition effect is strengthened by the increasing demand of a cleaner environment, resulting in the adoption of stricter regulations (Dinda, 2004).

Finally, the technique effect covers the impact of MNEs' engagement in access to electricity growth, through the implementation of better and less emission-intensive technologies and managerial practices and, has a positive effect on the environment (Oetzel and Doh, 2009). However, some scholars argue that to be able to absorb, adapt and master foreign cleaner technology and environmental sustainable practices, local people, institutions and firms need to possess a minimum level of educational and technical competences, which strictly depends on the level of economic development of the country, i.e., nonlinear relation between FDI spillover and economic growth (Meyer and Sinani, 2009).

Therefore, when MNEs raise the access to electricity of developing countries, their side effects on the environment can be either positive or negative, and can strongly depend on the level of economic development of the host country (as see before) but also on the characteristics of the home countries. Specifically, MNEs' home country characteristics can generate three effects: country-of-origin, ratcheting-up and global competition effects (Zeng and Eastin, 2012).

The country-of–origin effect suggests that when firms invest abroad they bring with them organizational policies and practices originally developed to accommodate home-country regulation (Kostova and Zaheer, 1999). For this reason, foreign firms from developed countries

are more prone to pay higher wages, transfer more advanced technology, knowledge, and management practices, raising domestic savings, increasing competition and stimulating economic growth (Blömstrom and Kokko, 1998). An increase in the host country income level raises the demand for environmental quality and local governments' ability to provide electricity to local population (Antweiler *et al*., 2001; Zeng and Eastin, 2012).

The ratcheting-up effect is based on the lack of legitimacy that investors from low-income countries face with firm stakeholders (e.g., local consumers, shareholders, current and future business partners and consumers in developed export markets) when they invest in other developing countries (Lall, 1983; Ramachandran and Pant, 2010)[4]. Recent works suggest that in order to avoid costs related to the lack of legitimacy, low-income foreign firms assume an environmental constructive behavior in host developing countries and sometimes also adopt voluntary Environmental Management Systems that go above and beyond minimal regulatory compliance at home (Zeng and Eastin, 2012). In addition, this effect can generate a competitive dynamics that motivate host country firms to enhance their own environmental performances and to join foreign firms in the development of electricity infrastructure, reinforcing the positive benefits coming from MNEs' presence.

Finally, accordingly to the global competition effect, the raise of MNEs from developing countries has intensified global competition leading to an overall evolution of firms' behavior. This has generated a virtuous circle, where all firms are compelled to adopt a social behavior and environmental friendly policies, independently on the country of origin (Zeng and Eastin, 2012).

Summarizing, on one hand, for the country-of-origin effect, MNEs from high-income countries are the most effective in reducing environmental degradation and raising access to electricity of host economy. On the other hand, the ratcheting-up effect asserts that the most virtuous MNEs are those from poor countries. Finally, based on the global competition effect MNEs can reduce environmental degradation and raise access to electricity independently on the country of origin.

Based on the all above considerations, the second sub-research question of this thesis states as follows.

[4] Legitimacy is the acceptance of the firm by its environment and it is vital for firm survival and success (Suchman, 1995).

RQ2. What are the side effects on the environment when MNEs drive the enhancement of the access to electricity in developing countries?

Finally, in addition to the study of the impact of MNEs on the access to electricity growth in developing countries, this work aims to understand the motivations behind MNEs' involvement and the effects on their performances.

The provision of electricity may be related to the MNE's market or non-market strategies (Doh *et al*., 2012). In the case of market strategies, MNEs develop infrastructure for the production, transmission and distribution of electricity as part of their core product/service or as part of the chain of activities responsible for delivering that product/service. On the contrary, in other industrial sectors, MNEs need to supplement governmental activities in the provision of electricity as part of their non-market strategies, essential to gain the legitimacy necessary to countervail their liabilities of being a foreign as well as a profit-driven company (Kostova and Zaheer, 2009). When the provision of electricity is part of MNEs' non-market strategies, the literature suggests that they have to be broken in two types, i.e., corporate political activity (CPA) and corporate social responsibility (CSR), which based on Meznar and Nigh (1995) correspond to two different mechanisms: buffering and bridging. Through CPA (buffering mechanism) firm manage to keep out unwanted political interferences with the internal operations, protecting them from the external environment. On the contrary, CSR (bridge mechanism) allows firms to connect with the external environment in the attempt to conform to the external expectations.

The impact of CSR and CPA on MNEs' performances has been widely investigated in the literature, leading to different results (Aguinis and Glavas, 2012; Mellhai *et al*., 2016). On one side, a group of scholars finds that CSR activities raise reputation, consumer loyalty and, ameliorate firm evaluations, stakeholder relations, financial performance and firm capabilities (e.g., operational efficiency, product quality, demographic diversity). In addition, CSR enhances organizational identification, employee engagement, organizational citizenship behavior, attractiveness to potential employees and, allows adapting to the local context reducing firm risk (Getz, 2001; Aguinis and Glavas, 2012). On the other side, another group of scholars finds that CSR actions are often affected by organizational inertia and they tend to be approached philanthropically rather than strategically. This push firms to blindly finance any good cause that

benefits the society, without strategically focus on a specific issue or area, generating more disadvantages that benefits (Burke and Logsdon, 1996). This implies that without a solid strategic base behind CSR implementation, firms waste valuable resources in social initiatives that do not actually generate value neither for the company neither for the society (Friedman, 1970; Porter and Kramer, 2006).

The other form of non-market strategy is CPA, which helps MNEs to shape the regulatory environment where they operate (e.g., reduce government regulation on the private sector), or to affect government decision process (e.g., obtain license, access to strategic assets or win public calls) (Frynas and Stephens, 2015). For this reason, CPA is particularly important in developing countries, where resource dependencies on the governments are stronger than elsewhere and MNEs have to develop political connections to access critical political resources and protect themselves from the risk of political extortion (Hillman and Keim, 2001). The study of CPA has often been related to its impact on firm performance. An extensive body of literature claims that CPA and performance are positively related. Frynas *et al.* (2006) find that political strategies lead to first-mover advantages; while McWilliams *et al*. (2002) demonstrate that CPA raises firm-specific advantages because allows firms to manipulate regulation and raising rivals' costs. In addition, Shaffer and Hillman (2000) find that a positive relation between CPA strategies and various performance dimensions, such as gross profit margin and market shares' increase; while Hillman and Hitt (1999) show that firms raise returns to shareholders when the top management collaborate with federal office. Nonetheless, some negative associations could exist between CPA and MNEs' performances. For instance, Li, *et al.* (2009) found that the positive performance effect coming from the product differentiation strategy adopted by foreign firms in China was weakened by the managerial political connections they developed with Chinese government officials. At the same time, Henisz (2002) shows that in a dynamic business environment, strong connections between firms and local political institutions can have unintended adverse impacts on business activities, as they could speed up the obsolescence process and reduce firm efficiency.

In conclusion, what emerge is that the analysis of motivations/strategies is fundamental to understand more in details the conditions under which MNEs that operate in developing countries, by stimulating the access to electricity, are more likely to raise their performances,

successfully replying to pressures from their internal and external stakeholders. This leads to the third and last sub-research question of this project that states as follow.

RQ3. a) What does motivate MNEs to raise the access to electricity of local population in developing countries? b) How does the difference in the motivation affect MNEs' performances?

CHAPTER 3. DISCIPLINARY AND METHODOLOGICAL CHALLENGES

In order to reply to the three research questions presented in Chapter 2, I rely on multiple disciplines and I perform an articulated empirical study, which starts from a country-level perspective and moves to a project/firm-level perspective. This variety of levels of analysis and disciplines poses several challenges, which are going to be presented in this chapter.

3.1 COUNTRY-LEVEL ANALYSIS

In order to reply to the first two research questions a country-level analysis is done.

This requires the adoption of multiple datasets and innovative sources to overcome the historical lack of indicators that affects developing countries, mainly when a specific region (i.e., sub-Saharan Africa) and a specific dimension of development (i.e., electricity) are taken into consideration.

Namely, the presence of MNEs is proxied by inward FDI stocks disaggregated according to home and host country, i.e., country-pair FDI, sourced from UNCTAD.

The access to electricity measures the percentage of households with access to a minimum level of electricity consumption per year (Source: IEA)[5].

The environmental quality is proxied by the carbon factor, measured as the ratio between CO_2 emissions from the combustion of fossil fuels for energy use (Source: World Bank), and the unit of energy use, equals to the total primary energy consumption (Source: International Energy Statistics). This variable is a good proxy of environmental quality, as carbon emissions are at the

[5] The consumption threshold is computed by assuming five people per household and is set equal to 250 kilowatt-hours (kWh) per year for rural households and to 500 kWh per year for urban households (IEA, 2014).

origin of global warming and, at the same time, are correlated with other pollutants that are locally noxious, such as nitrogen oxide and sulphur dioxide (Kivyiro and Arminen, 2014).

The measurement of the quality of country's institutions represents a big challenge in this work. First, because it is important to understand which dimensions of the country's institutional environment affect MNEs' ability in raising access to electricity (for details see Paper 1 in Annex). Second, following the seminar work of North (1990), it is important to distinguish institutions in formal and informal. Formal institutional quality is proxied by the more classical six World Bank's Worldwide Governance Indicators (WGIs), extensively used in academic research (Winters and Martinez, 2015)[6]. Therefore, to strength the results obtained with these indicators also the more innovative institutional indicators developed by the Fund-for-Peace (FFP) are used[7]. Measuring the quality of country's informal institutions poses a much bigger challenge, as generally these institutions refer to community or individual's characteristics (Ostrom, 2000). Specifically, two proxies are adopted: the institutional collectivism indicator sourced from the Global Leadership and Organizational Behaviour Effectiveness (GLOBE) project and, the degree of interpersonal trust sourced from the World Value Survey (WVS).

Finally, the level of home and host country economic development is measured by means of the gross domestic product pro capita (GDP pro capita), sourced from the World Bank Development Indicators dataset.

The use of multiple sources creates several challenges and consistency problems, and leads to a significant loss of observations. In order to limit this loss, I rely on multiple imputation techniques for the treatment of missing data (Allison, 2001)[8]. This brings to the creation of a panel dataset of

[6] The six Worldwide Governance Indicators are: regulatory quality, control of corruption, voice and accountability, rule of law, governance effectiveness and, political stability and the absence of violence and terrorism.

[7] The six Fund for Peace institutional indicators are state legitimacy, state's ability to provide public services, presence of factionalized elites, interventions from external actors, human rights, rule of law and security apparatus.

[8] With multiple imputation, missing values are drawn from a distribution of observed variables, including the variables at stake, and can lead to consistent, asymptotically efficient, and asymptotically normal estimates (Allison, 2001). In addition, in order to guarantee the consistency of imputed data, all the paired countries with less than three observations per variable have been removed.

pairs of 83 home countries and 15 host countries from sub-Saharan Africa, observed from 2005 to 2011, for a total of 1547 observations.

Once the dataset has been built, the study of the impact of MNEs on the access to electricity, moderated for economic and institutional factors and controlled for the side effects on the environment, is done by adapting the Solow's growth model to a dynamic panel data setting (Solow, 1957), as showed in the following equation (for details about model specifications see Papers 1, 2 and 3).

$$\Delta y_{i,t} = \alpha_0 + (\alpha - 1) y_{i.t-1} + x'_{i,t-1}\beta + \chi_i + \varphi_{t-1} + \varepsilon_{i,t-1}$$

$$for\ i = 1, \dots, N\ and\ t = 2, \dots, T$$

According to the literature on dynamic panel data, the model is estimated sometimes by means of the system Generalized Method of Moments (Blundell and Bond, 1998), and sometimes by means of the corrected Least Square Dummy Variables estimator (Bruno, 2005). The choice of the estimator depends on the characteristics of the indicators specifically used in each paper (for details see the Papers 1, 2 and 3 in Annex).

Last but not least, the country-level analysis poses not only methodological challenges but also important disciplinary ones. Indeed, a dialogue has been open with various disciplines, which ranges from International Business to Management, Development Economics, Infrastructure Policies and Environmental Economics fields. This interdisciplinary entails a big effort in order to make the work consistent and understandable to different research communities, which rarely talk each other's and often analyze similar problems but from different perspective.

Despite these challenges, the country-level analysis is an essential part of this thesis, as it gives a far-reaching view of the phenomenon as a whole. However, it has the unsurmountable limit that does not allow seeing the channels through which MNEs raise the access to electricity, but only hypothesizing that they do it by building electricity infrastructure. In addition, it allows only hypothesizing that a possible reason behind MNEs' involvement in the raise of access to electricity for local population is the research of legitimacy with local stakeholders, but does not allow knowing if this research of legitimacy targets only few powerful stakeholders, e.g.,

politicians or governmental officials (Hillman *et al.,* 2004). In order to partially overcome these limitations a project/firm-level analysis is done.

3.2 PROJECT/FIRM-LEVEL ANALYSIS

Despite the shift to a project/firm-level analysis is an essential step to make this thesis more complete, this is not an easy step due to the well-known problem of lack of meso and micro level data, particularly in sub-Saharan Africa. In order to overcome this limitation two projects have been developed.

The first project consists in building, by means of Web-based data (i.e., data extracted from research engines such as Google or Bing), new indicators that track, on a large scale, the involvement of MNEs in electricity infrastructure projects in Africa and the motivations behind their involvement. This project is developed in collaboration with the Department of Electronics, Information and Bioengineering of Politecnico di Milano and the private company Celi. As this project is still in a preliminary phase, I am not going to present it much in details; therefore, more information can be found in the Future Research Development chapter.

The second project is already finished and aims to use dictionary based content analysis techniques to build-up new indicators that track the motivations behind MNEs' involvement in electricity infrastructure projects in sub-Saharan Africa and the impact that this involvement has on MNEs' performances. Specifically, we focus on non-market strategies, disentangling them in CPA and CSR and we identify four dimensions of performances (i.e., economic, access to strategic resources, firm's efficiency and firm's reputation performances). The dictionary-based content analysis is done on more than 5000 documents extracted from different sources in Lexis-Nexis (i.e., news, industry and company reports), which contain information about one hundred couples of firms-projects, drawn from the World Bank Private participation in Infrastructure (PPI) Projects database. Projects concern electricity infrastructure financed in sub-Saharan Africa from 2000 to 2014 and firms are private large investors involved in these projects, belonging to the supply chain of electricity. A cross section database is built, composed by 93 observations (for details about the dictionary-based content analysis see the Paper 4 in Annex). Once the database is created, an econometric model is developed and tested by means of the Tobit estimator (Tobin, 1958). Results of Tobit estimations are going to be presented in the Chapter 4.

I am aware that the size and innovative contribution of this project is potentially much smaller than the one based on Web-based data. However, it allows moving a first step in a field explored little so far. In addition, this project poses interesting challenges for the development of the theoretical construct, as it requires the integration of different literature streams of the International Business and Managements fields. Namely, literature about CSR, CPA and relationship between firms' non-market strategies and performances (Hillman *et al.,* 2004; Boddewyn and Doh, 2011; Kolk, 2016; Mellhai *et al.*, 2016).

CHAPTER 4. PAPERS PRESENTATION

In order to reply to the thesis research questions, four papers have been developed, which are at different stages of publication. Specifically, the first three papers represent the country-level analysis of this work, while the fourth paper is a first effort to analyze the phenomenon with a firm perspective.

Table 1 lists the four papers, showing co-authors, target journals, up-to-date publication status and, addressed thesis research questions.

The final manuscripts of the papers are in Annex. As the papers have been targeted to different journals, their layouts are not homogenous.

[Insert Table 1 here]

PAPER 1 - CAN MULTINATIONAL ENTERPRISES LIGHT-UP DEVELOPING COUNTRIES? EVIDENCE FROM THE ACCESS TO ELECTRICITY IN SUB-SAHARAN AFRICA

The first paper addresses the first question (RQ1) of the thesis and examines the role that MNEs can have in enhancing the access to electricity for local communities in developing countries, based on the quality of home and host institutions. Specifically, two hypotheses are formulated following the literatures on institutional voids (Khanna and Palepu, 1997), institutional arrangements for infrastructure provision (Levy and Spiller, 1994), liability of origin (Ramachandran and Pant, 2010) and firm's competitive advantage in developing countries (Cuervo-Cazurra and Genc, 2008). They state as follows: *1) MNEs are more likely to promote the access to electricity in countries that suffer from institutional voids than in countries with well-*

established institutions; 2) In countries that suffer from institutional voids, MNEs from institutionally weak countries are more effective in promoting the access to electricity, compared to MNEs from well-established institutional environments.

Graph 1 displays the theoretical framework developed for this paper, tested throughout empirical analysis.

[Insert Graph 1 here]

Our findings, robust across several specifications and checks, show that in countries affected by institutional voids, MNEs can promote access to electricity, and this is more likely when they come from institutionally weak countries. Reasons could be many. First, MNEs need electricity for their business activities (Khavul and Bruton, 2013). Thus, it is reasonable to assume that MNEs raise access to electricity mainly by developing electricity infrastructure, as these assets are essential for their daily activities. However, infrastructure can also be employed as legitimation strategy with their stakeholders (Oetzel and Doh, 2009). In fact, we find that MNEs from institutionally weak countries are more likely to increase access to electricity. We argue this is due to the fact that those MNEs generally suffer from a higher lack of legitimacy, compared with companies from highly institutionally developed economies (Cuervo-Cazurra and Ramamurti, 2014). At the same time, they are already familiar with difficult institutional conditions, and know how to deal with the lack of provision of electricity by local governments (Cuervo-Cazurra and Genc, 2008; Boddewyn and Doh, 2011).

This paper makes an important contribution to the on-going debate on the impact of MNEs and institutions on poverty alleviation in developing countries (Kolk and Van Tulder, 2006), and on the institutional economics literature (Bergara et al., 1998; Henisz 2002). In fact, the empirical evidence goes against the common knowledge that a regulatory authority is necessary in the infrastructure sector to restrain the tendency of private firms of exerting monopoly power, and show that it is in a context of institutional voids that private sector can bring a higher contribution to development.

This paper has been accepted and published in the World Development Journal.

PAPER 2 – MULTINATIONAL ENTERPRISES AND THE PROVISION OF COLLECTIVE GOODS IN DEVELOPING COUNTRIES UNDER INFORMAL INSTITUTIONAL VOIDS: THE CASE OF ELECTRICITY IN SUB-SAHARAN AFRICA

This second paper is an extension of the previous one, and born from the awareness than the first paper focuses only on formal institutions, while in reality, the concept of institutions is much wider.

In fact, following North's (1990) classification, institutions are generally understood as formal and informal. Formal institutions are rules observable through written documents or rules that are determined and executed through formal positions, such as authority or ownership. Informal institutions are non-codified systems of shared values and collective understanding, which shape cohesion and coordination among individuals in a society (Holmes *et al.,* 2013). Considering both types of institutions is important, especially because in a context of formal institutional voids (as the one analysed in Paper 1), informal institutions can emerge as important entities for the provision of electricity (Teegen, 2003).

Namely, informal institutions can complement, and often supplant, formal institutions, in the provision of electricity through NGOs (Teegen, 2003) and/or self-organized systems, owned and/or managed by a group of consumers or by local communities, e.g., electricity cooperatives (Ostrom *et al.,* 1993; Hansmann, 1996). However, while formal institutions -governments- provide electricity mainly through the development of large national or regional grids, informal institutions - electricity cooperatives and NGOs – may provide electricity through the management, operation and maintenance of local mini-grid and off-grid systems[9] (IEA, 2014).

The correct functioning of these self-organized solutions requires collective actions from local communities and/or NGOs (Ostrom *et al*., 1993; Hansmann, 1996), and their success strongly depends on the degree of participation and interpersonal trust between members, which is an expression of the informal institutional environment (Rudd, 2004). Specifically, informal institutions can supplement the lack of strong formal institutions where community members trust each other and act based on group rationality rather than individual rationality (Ostrom,

[9] Mini-grids link households and other consumers, but are not connected to larger regional grids; off-grids are stand-alone systems for individual households or consumers (IEA, 2014).

2000). On the contrary, individualist and distrusted societies generally have bigger difficulties in coordinating self-organized and collective actions, undermining the long-term development of the community and generating a sort of *informal institutional void* (Ostrom *et al*., 1993; Holmes *et al*., 2013).

Starting from these considerations, this paper wants to demonstrate that it is precisely on a context not only of formal but also of informal institutional void that MNEs can have an active role in raising the access to electricity for local population. This is more likely to be true if the MNEs come from countries similar in the informal institutional settings, i.e., individualist and distrusted societies. Indeed, managers from individualist and distrusted countries are already familiar with the inability of local communities and NGOs in compensating the weakness of national government and implementing sound and lasting actions for the provision of electricity to local population. For this reason, compared with MNEs from countries with strong informal institutions, MNEs from countries affected by informal institutional voids are more likely to have already developed in-house alternative solutions for the provision of electricity to the population of the countries where they operate.

Even in this case an empirical analysis is done. Estimates strength and complement the results of the previous paper. Indeed, they demonstrate that MNEs' strategies and practices are significantly shaped not only by the formal institutional environment in which they operate and where they come from, but also by the informal one.

This paper is going to be submitted to Journal of International Management.

PAPER 3 - THE IMPACT OF FDI ON ACCESS TO ELECTRICITY AND CARBON FACTOR IN DEVELOPING COUNTRIES

The third paper addresses the thesis' second research question (RQ2) and looks at the effects that FDI has on the environment simultaneously with better access to electricity of developing countries. As these effects are inherently ambiguous and could depend on several contextual influences, this paper takes into consideration also the moderating role of the level of economic development of both home, and host countries.

In addition, the ambiguity of these effects (for an overview see Chapter 2) makes difficult the development of hypotheses, and leads rather to the formulation of research questions that state as follows. *1) How do the effects of FDI on the access to electricity depend on the level of economic development of the host country?; 2) By raising the access to electricity, what are the effects of FDI on the environmental quality of developing country?; 3) How do the effects on environmental quality depend on the level of economic development of the host country?*

Graph 2 gives an overview of the theoretical framework developed for this paper.

[Insert Graph 2 here]

Results of the empirical analysis show that poor countries benefit only from the presence of FDI from rich countries, and only from an environmental point of view. The reason could be that FDI from rich countries is expected to import technologies and business practices that are cleaner and more sustainable than those adopted by domestic firms are. However, in the majority of cases, poor countries tend to attract mainly resource-seeking investments, generally coming from extractive industry. This type of investment in not effective in fostering economic growth, undermining the local economy's ability to develop infrastructure for the production, transmission and distributions of electricity to the population. In addition, even though extractive companies invest in new electricity infrastructure, as they are useful for their business activities, they build assets that probably could not be used for public purposes, because of the specific location or technical standards.

The impact of FDI is reversed when host country has already reached a certain level of economic development. In this situation, indeed, foreign investments from poor countries are more likely to have positive effects than FDI from richer countries. However, these positive effects are concentrated only on the social dimension of electricity access, while they are negative if we look at the environmental quality. Developing country foreign investors appear effective in fostering access to electricity. A possible explanation is that they need to fill a larger gap in legitimacy with their stakeholders, compared with those from developed country. To do it, they need to implement legitimation strategies. The construction of electricity infrastructure for private and public purposes could be one these strategies, as it consents to leverage on the ability of managers to deal with challenging and budget constrained environments. FDI from developing countries, nevertheless, entails negative consequences on the environment, as investors from

these countries still have a strong technological disadvantage or adopt business practices that are constrained by the economic development of their countries of origin.

This paper has been submitted to the Environment and Development Economics Journal.

PAPER 4 - CORPORATE POLITICAL ACTIVITIES AND CORPORATE SOCIAL RESPONSIBILITY AND THEIR IMPACT ON FIRM PERFORMANCE: A STUDY ON THE ELECTRICITY SECTOR IN SUB-SAHARAN AFRICA

With this fourth paper, in order to reply to thesis' third research question (RQ3), the analysis moves from a country to a firm perspective. Indeed, this paper focuses on large firms operating in the supply chain of electricity that have been involved in electricity infrastructure projects in sub-Saharan Africa. It builds up an integrated framework to study what type of non-market strategy (i.e., CPA or CSR) there is behind the involvement of large firms in these projects, and how this affects their performances.

Based on the literature review, four main categories of performances are identifies: economic, resource, reputation, and efficiency performances (Hillman and Keim, 2001; Frynas *et al*., 2006; Ramsey and Bahia, 2013; Madsen and Rodgers, 2015; Mellahi *et al.,* 2016). Firms' economic performances are indicators that reflect the fulfilment of economic and financial goals by the firm and include both accounting based and market-based measures such as ROI, ROA, ROE, PM, EPS and stock price. Firms' resource performance refer to the degree to which firms have access to strategic resources (e.g. land, natural resources, water and infrastructure) and the right to exploit them. Firms' reputation performance refers to the firm legitimacy and brand recognition by the internal (e.g., employees or managers) and external stakeholders (e.g., customers, suppliers, local communities, NGOs). Finally, the efficiency refers to the all non-financial factors that may have an impact on performance and that have to do with the process management and firm organizational governance structure (e.g., how people coordinate their actions and use the resources within the organization).

As already mentioned, non-market strategies are broken in two types, i.e., CPA and CSR. Starting from the existing literature and the study of firm sustainability reports, four main areas are considered in which CSR activities are implemented in developing countries: economic development, environment protection, human rights and education and, health and provision of

public services. Further, following the classification of Hillman and Hitt (1999), three typologies of CPA are identifies. Namely, information, financial incentives and, constituency building.

To study all above presented performances and their linkages with non-market strategies lead to the creation of an integrated conceptual framework. Due to the explorative nature of this paper research questions are formulated instead of hypotheses. They state as follow: 1) I*n developing countries, do non-market strategies result in improved firm performances?; 2) Which non-market strategy (CPA or CSR) is more strongly associated with improved firm performances?.*

For an overview of the conceptual framework developed for this paper see Graph 3.

[Insert Graph 3 here]

What emerges from the empirical analysis is that for large firms operating in developing countries and involved in the supply chain of electricity, generally speaking, non-market strategies are important. Namely, both types of non-market strategies are linked to all types of considered performances. However, except that for the dimension of organizational efficiency, linkages between firms' performances are statistically more significant with CPA. The reason of the higher effectiveness of CPA initiatives (compared with the CSR ones) could be imputed to the political instability that characterizes many countries of sub-Saharan Africa (which is the focus and empirical setting of this paper). Indeed, in a context of political instability, CPA strategies help firms to shape the regulatory environment (e.g., reduce government regulation on the private sector) or to affect government decision process (e.g., obtain licensing, access to strategic assets or win public calls) (Frynas and Stephens, 2015). In addition, in most of the countries of the region, there are strong resource dependencies between firms and governments, which oblige firms to develop political connections to access critical political resources and protect them self from the risk of political extortion (Hillman and Keim, 2001).

These results are interesting because, besides providing information about the linkages between firms' non-market strategies and performances, could also be used to source information about how large firms prioritize their stakeholder groups based on the type of performance they seek to achieve. In fact, developing countries are generally affected by institutional voids that can raise the risk of expropriation and undermine the profitability of infrastructure investment (Khanna and Palepu, 1997; Levy and Spiller, 1994). For this reason, for firms that operate in these countries, in order to raise economic performance it is essential to improve their reputation with

politicians and local officials, which become their principal stakeholders. This is also true when the scope of the firm is to get access to strategic resources, showing that in these contexts civil society is important but is not the main stakeholder. On the contrary, amelioration of organizational efficiency requires strategies that target a wider set of stakeholders, which range from employees, to managers, to competitors, to backward and forward linkages, to civil society, to political class.

This paper is going to be submitted to the Journal of Business Ethics.

CHAPTER 5. CONTRIBUTION AND IMPACT

The main objective of this thesis is to understand the conditions that make MNEs effective in enhancing the prosperity and well-being of the developing countries where they invest. In doing so, the work addresses the case of sub-Saharan Africa and focuses on a specific dimension of development, electricity. Namely, the thesis gauges how economic and institutional conditions of the countries of origin and destination of MNEs' investments favor the involvement of MNEs in the provision of electricity to local population, presumably through the construction, maintenance and expansion of infrastructure for the production, transmission and distribution of electricity. In addition, the work studies the outcomes that the involvement of MNEs in the electrification process of developing countries can have on the environment. Finally, it analyzes the motivations of MNEs' engagement in electricity infrastructure projects, and how this affects their performances. For this purposes four papers have been developed, which move from a country (Papers 1,2 and 3) to a firm perspective (Paper 4).

The thesis demonstrates that MNEs raise the electrification of developing countries if they operate in contexts with weak formal and informal institutions and come from countries with a similar institutional fragility. The reason could be that managers already developed at home the ability to deal with a challenging institutional environment, over time in a learning-by-doing manner (Kostova and Zaheer, 1999; Cuervo-Cazurra and Genc, 2008). In addition, this ability could represent a competitive advantage for MNEs from institutionally weak countries, as it can be strategically exploited to overcome the serious lack of legitimation, whereby these firms generally suffer with their stakeholders (Ramachandran and Pant, 2010).

Looking at the stage of economic development of both home and host country, MNEs are found to foster electrification when the host country has reached a certain level of economic development and the home country is poor. Indeed, poor host countries tend to attract mainly MNEs operating in the extractive industry, which develop a private electricity infrastructure. This is difficult to exploit for welfare services due to their specific characteristics (e.g., they are located in remote areas, or the voltage of power grid does not match with national grid requirements) (Morris *et* al., 2012). As consequence, host governments, stocked to its budget constraints, are unable to exploit MNEs' presence for public purposes. On the contrary, host countries at a higher stage of economic development attract MNEs from different sectors and are more able to take advantage from their presence (Meyer and Sinai, 2009).

However, by raising the access to electricity in the developing countries where they invest, MNEs from poorer countries raise also the environmental degradation of these countries. The reason could be that these firms still have a strong technological disadvantage, compared to firms from rich countries, and adopt limited sustainable business practices, as they are constrained by the economic development of their countries of origin (Zeng and Eastin, 2012). In addition, as MNEs are more effective in raising the access to electricity in countries affected by institutional voids, it is reasonable to assume that even though the host country has reached a certain level of economic development its institutions are still weak and ineffective in implementing strong policies for the protection of the environment.

Finally, the thesis shows that, in developing countries, non-market strategies have a large impact on firms' performances. Namely, the implementation of CPA and CSR initiatives is linked to an increase of firm's economic performance, reputation with stakeholders, access to strategic resources and organizational efficiency. However, except that for the dimension of organizational efficiency, the linkages between firms' performances are statistically more significant with CPA.

An overview of the thesis' results is showed by Graph 4.

[Insert Graph 4 here]

The strength and novelty of this thesis is that it integrates several debates and contributes to different streams of research. Namely, it contributes to the research on MNEs' impact in host developing countries and their mediating factors (Kolk and Van Tulder, 2006; Oetzel and Doh, 2009; Narula and Dunning, 2010; Narual and Kodiyat, 2016); on institutions and provision of

collective goods (Levy and Spiller, 1996; Khanna and Palepu, 1997; Ostrom, 2000; Henisz, 2002; Boddewyn and Doh, 2011) and; on MNEs' legitimation mechanisms (Kostova and Zaheer, 1999; Cuervo-Cazurra and Genc, 2008). Further, it adds to the research on the environmental consequences of MNEs' presence and economic growth (Hübler and Keller, 2010; Narual and Ddriffield, 2012; Zeng and Eastin, 2012; Narual and Pinelli, 2016) and; research on non-market strategies and their impact on firms' performances (Hillman and Keim, 2001; Mellahi et al., 2016). At the same time, this thesis has important managerial and policy implications for both firms' managers and developing countries' governments. Indeed, an analysis of the conditions that make a private investment effective in terms of energy poverty alleviation and environmental preservation is fundamental to understand which type of MNEs should be attracted and to guide the development and implementation of specific energy policies in each country. At the same time, this thesis also concerns MNEs themselves. In fact, these companies are under constant pressure to continuously increase shareholder returns. In order to achieve this objective, MNEs need to increase their investments in developing countries and participate in their long-term growth and prosperity (Oetzel and Doh, 2009; Gratton, 2014). In this perspective, the enhancement of access to electricity could be a viable strategy to create the conditions for settling-in durable and profitable new business activities in these countries.

CHAPTER 6. FUTURE RESEARCH DEVELOPMENTS

The present thesis documents the conditions under which MNEs can raise the access to electricity for local population in developing countries, taking into account the side effects that this can have on the environment and the benefits that MNEs can obtain from this initiative in term of performances. To the best of my knowledge, this is the first attempt to study in an integrated way the complex relationships between MNEs and host country's energy development. In addition, the project focuses on sub-Saharan Africa, a region that so far has received limited attention.

I am aware that this work is not immune to limitations. First, despite the focus on sub-Saharan Africa allows controlling for region fixed effects, it limits the generalizability of the results. Potential future research could be done by enlarging the analysis to other regions, starting from the developing ones, such as Latin America or developing Asia. In addition, the study could be

expanded to other goods essential for development, but still scarce in developing countries, e.g., drinkable water, transportations, or telecommunication systems.

However, the real challenge in studying MNEs' impact on the host country development, particularly in developing countries, is the lack of indicators that allow to look inside the "black box" of the relationship between MNEs and development at a micro level and, on a large spatial and temporal scale (Einav and Levin, 2014). In fact, generally studies of MNEs' impact rely on macroeconomic data, which suffer from summing different or even diverging effects of MNEs' presence and, allow only correlation analyses. Starting from the 80s, methods, such as surveys and content analysis, have been used to overcome this limitation, but the problem has been only partially solved. Indeed, even though data collected with these methods measure individual firm-level and/or community-level phenomena, they suffer from substantial missing data issues, small size, and can extend back only for a few years, limiting the research to cross-sections or small panel datasets (Einav and Levin, 2014). More qualitative methods, such as action research or case studies, have also been used to study MNEs' impact in depth. However, if from one side they have the potential to investigate phenomena at a micro level, they do not lend themselves to generalizations.

In this scenario, as already briefly mentioned in Chapter 3, in collaboration with my supervisors, the Department of Electronics, Information and Bioengineering of Politecnico di Milano and the company Celi, we started to develop a new methodology that has the potential to overcome these limitations, by using data extracted from the Internet, i.e., Web-based data. In fact, Web-based information, similarly to qualitative research, may reveal micro effects of MNEs' presence. At the same time, the Web-based approach may expand traditional datasets to embrace a greater number of firms and communities, and may repeat measures over time, conferring a longitudinal dimension to data. Of course, there are disadvantages, mainly in terms of representativeness and recording of random variations, fluctuations and noise during the measurement (Einav and Levin, 2014; Liu *et al.,* 2015). Nevertheless, a tentative in this direction should be done.

A pilot case in currently under development. Namely, we are using Web-based data to work out a new indicator that detects direct and indirect participation of MNEs in the provision of physical electricity infrastructure in Africa and the motivations of MNEs' engagement. The sample is

composed by 26 greenfield and revamping electricity infrastructure projects, which were financially closed in 2012 in the continent, and are monitored by PPI database of the World Bank. The key source is complemented with the 2012 list of Fortune 500 Global Companies, a well-known directory of the largest companies in the world. We focus only on companies that operate in the production, transmission and distribution of electricity. The idea is to develop a tool that can provide on large-scale knowledge about the association between Fortune 500 MNEs and PPI projects from web content[10].

[10] More details are available upon request.

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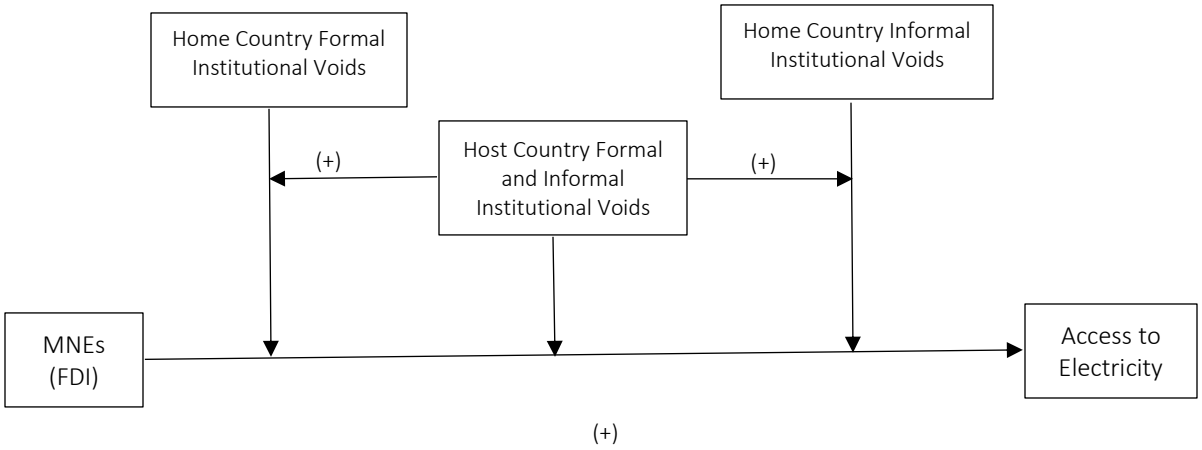
TABLES AND GRAPHS

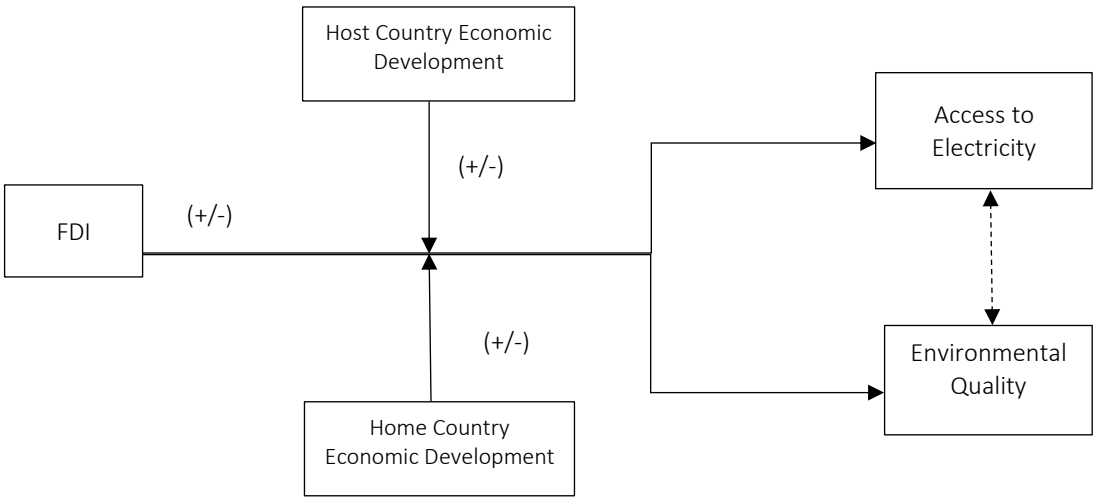
Table 1. Overview of Thesis Papers.

#	Title	Co-Authors	Target Journal	Publication Status	Addressed Research Question
Paper 1	*Can Multinational Enterprises Light-Up Developing Countries? Evidence from the Access To Electricity In Sub-Saharan Africa*	P. Garrone L. Piscitello	World Development	Accepted & Published	RQ1
Paper 2	*Multinational Enterprises and the Provision of Collective Goods in Developing Countries under Informal Institutional Void:* *The Case of Electricity in sub-Saharan Africa*	P. Garrone L. Piscitello	Journal of International Management	-	RQ1
Paper 3	*The Impact of FDI on Access to Electricity and Carbon Factor in Developing Countries*	P. Garrone L. Piscitello E. Colombo	Environment and Development Economics	Submitted	RQ2
Paper 4	*Corporate Political Activities and Corporate Social Responsibility and their Impact on Firm Performance:* *A study on the electricity sector in sub-Saharan Africa*	F. Albino J. Doh P. Garrone L. Piscitello	Journal of Business Ethics	-	RQ3

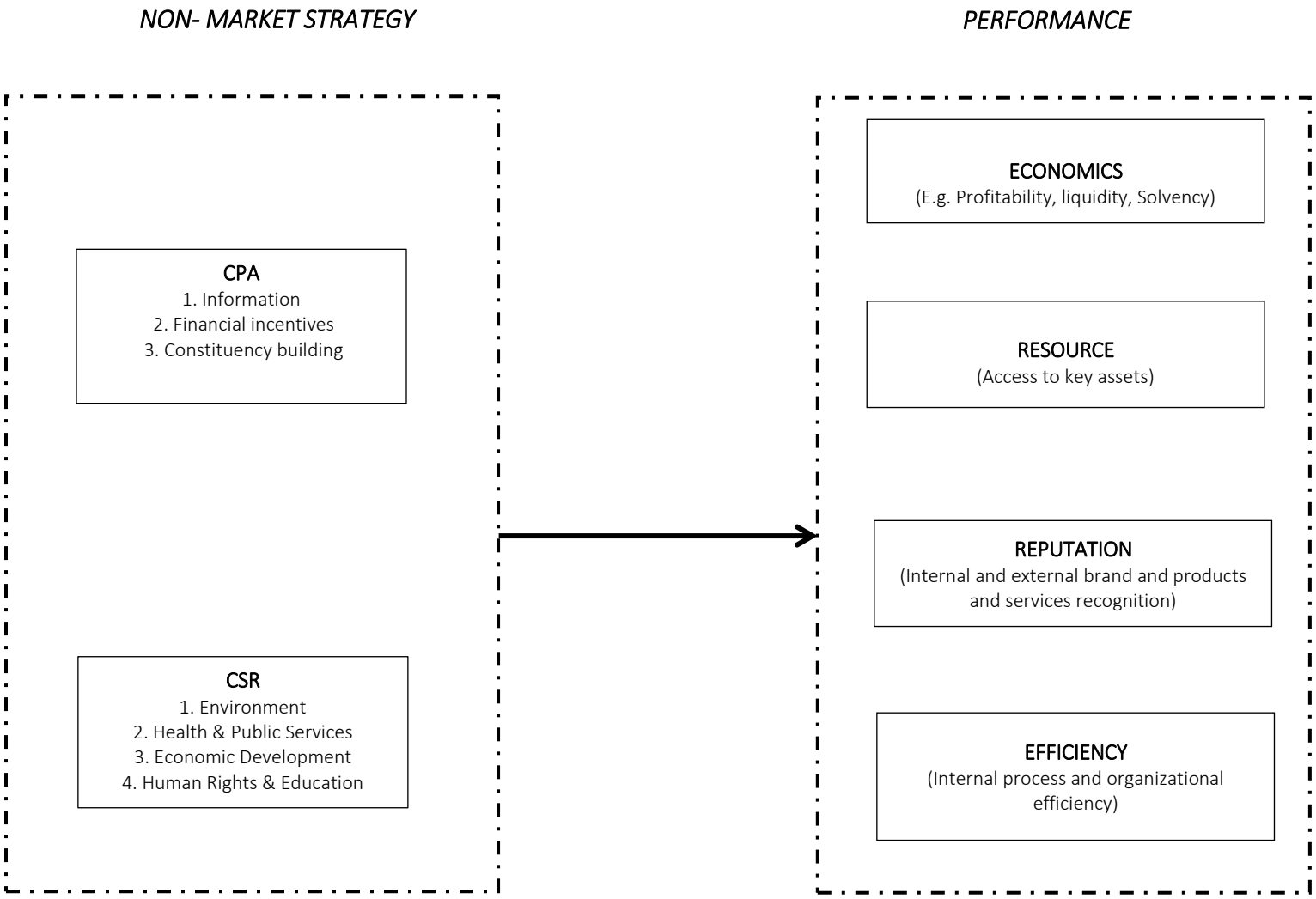
Graph 1. Theoretical Framework Papers 1 and 2.



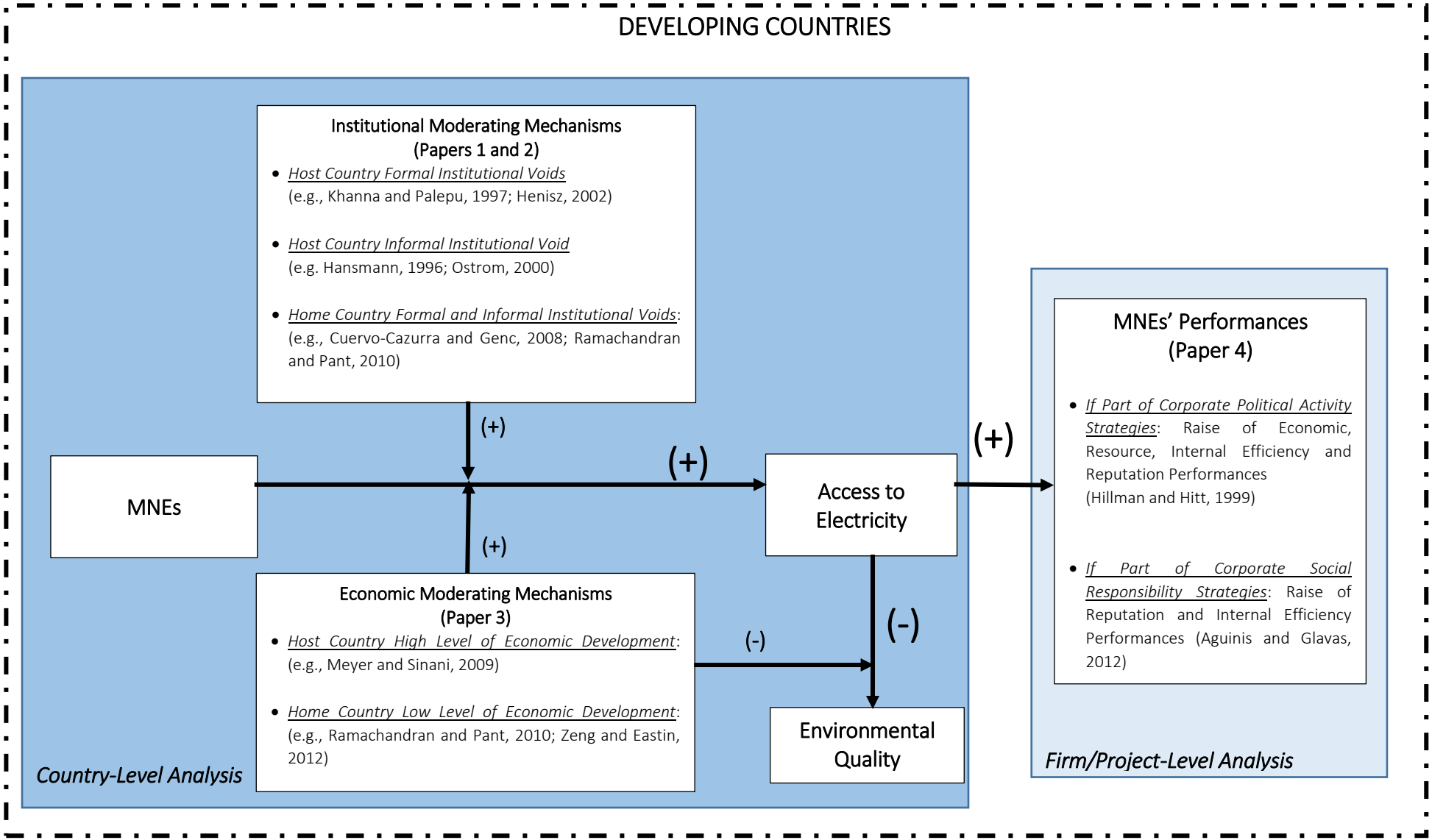
Graph 2. Theoretical Framework Paper 3.



Graph 3. Theoretical Framework Paper 4.



Graph 4. Summary of the Thesis Results.



ANNEX

A1. PAPER 1

Can Multinational Enterprises Light-Up Developing Countries?

Evidence from the Access To Electricity In Sub-Saharan Africa

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Department of Management, Economics and Industrial Engineering, Politecnico di Milano

Highlights

- MNEs and FDI can contribute to the electrification of developing countries
- MNEs' involvement in electrification is driven by operational and legitimacy needs
- Positive impacts are more likely if local institutions are weak
- MNEs' effectiveness also depends on the institutional quality of home country

Abstract

This paper examines the role that multinational enterprises (MNEs) and foreign direct investments (FDI) can have in enhancing the access to electricity for local communities in developing countries based on the quality of home and host institutions. Access to electricity is a marker for development but it is far from being universal in developing countries. The shortage of electricity is mainly the consequence of inability of governments in planning, financing and developing necessary electricity infrastructure. In this context, investments from other actors can be essential. Particularly, we focus on the role of FDI and MNEs. We claim that when MNEs invest in developing countries, they are incentivized to solve the lack of electricity infrastructure mainly for two reasons: to guarantee their business activities and to gain legitimacy with their local stakeholders. In addition, we argue that MNEs and FDI from institutionally underdeveloped countries will be more prone to develop infrastructure for the provision of electricity to local population, as generally they suffer from a negative stereotype. For this study, we rely on 1547 observations composed of pairs of 83 home countries and 15 host countries in sub-Saharan Africa, observed from 2005 to 2011. Due to the nature of the database, we adopt panel data techniques, i.e., system-GMM and corrected Least Square Dummy Variable estimators. We find

that FDI promotes access to electricity in developing countries with weak institutions and this is more likely true when FDI comes from institutionally underdeveloped countries. These results are far from obvious, as they controvert common idea among institutional scholars that a regulatory authority is essential in the provision of infrastructure.

In conclusion, with this paper we partially rehabilitate the image of MNEs investing in developing countries, by demonstrating that - under certain conditions - they could contribute to energy poverty alleviation of local population.

Keywords: FDI; MNE; Electricity Infrastructure; Institutions; Africa

I. Introduction

In the last years, the world is facing profound and escalating challenges, such as climate changes, poverty and inequality, and the rise of economic and financial crises. For decades, the most obvious candidates for solving these global problems were governments and global institutions, such as the World Bank or the International Monetary Fund. These institutions do in fact play a role; nevertheless, the Rio+20 summit emphasized the need for a much wider partnership. Among the partners that could act jointly to address these widespread challenges, multinational enterprises (MNEs) play a key role, as since the seventies they have been growing in size and capabilities (Gratton, 2014). For instance, Lodge and Wilson (2006) use value added (defined as the sum of salaries and pre-tax profits), as a measure the economic size and estimate that, in 2005, 29 of the world's largest economies were not countries, but multinationals. The necessity of MNEs' involvement has also been emphasized in the 2014 World Investment Report (WIR), released by the United Nations Conference on Trade and Development (UNCTAD). The WIR focuses on the contribution that the private sector could make to the 2030 Agenda for Sustainable Development and the related Sustainable Development Goals (SDGs), aimed at ending poverty, fighting inequality and injustice, and tackling climate change by 2030[11].

When talking about sustainable development, it is necessary to consider one of its fundamental and inescapable drivers, i.e., energy (Dinkelman, 2011). Access to modern energy services,

[11] See http://www.undp.org/content/undp/en/home/sdgoverview/post-2015-development-agenda.html (accessed on 14th March 2016).

particularly electricity, together with other commodities, functions and services, such as drinkable water, education, transportation, communication and health, is a collective good[12], and its provision is necessary both to enhance standards of living and to run business activities (eg., Kebede et al., 2010; Khavul and Bruton, 2013). However, in 2013, the International Energy Agency (IEA) estimates that 1.2 billion people (almost one fifth of the world population) do not have access to electricity. More than half is located in sub-Saharan Africa, a fifth in developing Asia (without China and India), 20 percent in India, and the rest in Latin America and Caribbean Sea, and North Africa and Middle East[13]. For this reason, in 2011, the United Nations General Secretary launched the Sustainable Energy for All Initiative (SE4All) with one of its objectives being the universal access to electricity by 2030[14]. However, to meet the goal the IEA evaluates that $50 billion of investments per year would be required (IEA, 2014).

The reasons of this shortage of electricity in developing countries could be imputed mainly to the rapid population growth and to the failure of local governments in defining sound electrification policies[15]. In fact, developing countries are generally affected by institutional voids, i.e., they lack those institutions that minimize the three main sources of market failure. Specifically, accordingly with Khanna and Palepu (1997) these sources are: (1) the lack of reliable market information; (2) the inefficiency of the judicial systems and; (3) the misguided regulations, i.e., when regulators place political goals over economic efficiency. This ineffective system of governance, together with other factors such as low rates of domestic savings and poor tax revenues, could actually undermine developing countries' ability in planning, financing and developing necessary

[12] Collective goods are commodities, functions and services that provide positive externalities to local collectivities and whose supply is assured by governments and/or private organizations. These goods are either non-excludable but rival or non-rival but excludable; public-economists call them "impure" public goods (Boddewyn and Doh, 2011).

[13] See http://www.worldenergyoutlook.org/resources/energydevelopment/energyaccessdatabase/ accessed on the 29th March 2015.

[14] The three objectives of the Sustainable Energy for All Initiative (SE4All) are: (1) universal energy access; (2) Double the global rate of improvement in energy efficiency, and (3) Double the share of renewable energy in the global energy mix by 2030 (See: http://www.se4all.org/our-vision_our-objectives, accessed on 30th of March 2016).

[15] By *failure* we mean "non- or sub-performance on account of factors (e.g., uncertainty and bounded rationality) that prevent or hamper institutions, organizations and individuals from fulfilling their functions" (Boddewyn and Doh, 2011 p. 348).

infrastructure for power production, transmission and distribution, leading to the scarcity of access to electricity for local communities (Robbins and Perkins, 2011).

The inability of local governments to provide electricity makes essential the involvement of different actors, such as development banks, no-profit organizations and the private sector, to guarantee the running of social and business activities (Boddewyn and Doh, 2011; Buckley and Boddewyn, 2015). In these circumstances, MNEs, which in the past twenty years have increasingly invested in developing countries, could possibly play a role. Based on the UNCTAD estimates, in 2013, foreign direct investment (FDI) flows to developing countries reaching a new high of $778 billion, which accounts for 54 percent of the global inflows. Developing Asia is the region with the highest FDI inflows, with a total amount of $426 billion, followed by Latin America and the Caribbean region, which experiences a growth of six percent, reaching a peak of $292 billion. Finally, Africa shows a growth rate of four percent and FDI inflows amount to $57 billion, whilst developing Oceania is the only region that remains stable at $3 billion.

While criticisms of the negative impact of MNEs continues to be vivid (for an overview see Oetzel and Doh, 2009), policy attention has been recently addressed to their potential added value in alleviating poverty. Accordingly, we argue that in countries where governments are too weak to provide infrastructure for the supply, distribution and transmission of electricity, MNEs can have a positive impact on the society. Indeed, MNEs and FDI can contribute to the expansion and modernization of electricity infrastructure, alone or with other players, as they need them to not only gain access to essential production inputs, reduce costs, and increase business opportunities, but also to stimulate the development of local communities and achieve legitimacy required to operate therein (North, 1990; Kostova and Zaheer, 1999). We also argue that the positive impact of MNEs and FDI is stronger when they come from institutionally weak home countries. Indeed, despite less sophisticated-resources and business practices, those MNEs are more likely to possess the managerial expertise needed to operate in contexts that are similar to their home country (Cuervo-Cazurra and Genc, 2008; Zeng and Eastin, 2012). These arguments are far from obvious, as it is common knowledge that a regulatory authority is necessary in the infrastructure sector to restrain the tendency of private firms of exerting monopoly power. In fact, highly specific investments (i.e., sunk costs), large economies of scale and scope, as well as widespread consumption imply that customers of infrastructure services have limited bargaining

power, and suppliers tend to adopt opportunistic behavior if regulation is absent (Williamson, 1976; Levy and Spiller, 1994; Sawant, 2010). For this reason, the delivery options for electricity have historically been either direct provision through state-owned enterprises or indirect provision through regulation of private business (Bergara et al., 1998).

In this paper, we focus on sub-Saharan Africa (SSA). The region has experienced an unprecedented presence of MNEs and FDI in the last ten year (UNCTAD, 2014); at the same time, in 2013, more than 30 percent of the population still has no access to electricity (for details see section III) (IEA, 2014). Our sample is composed by FDI into 15 sub-Saharan host countries from 83 home countries, observed throughout the 2005-2011 period. Given the nature of the data, the econometric analysis relies on dynamic panel techniques. Our findings confirm that MNEs and FDI could stimulate the access to electricity in developing countries affected by institutional voids, and this effect appears to be stronger when these companies come from institutionally weak environments.

With the present work we aim to contribute to the debate on the potentials and opportunities of MNEs in relation to poverty alleviation in general (Kolk and Van Tulder, 2006) and to the provision of electricity to the population in particular (Sesan et al., 2013). So far, this debate has received significant attention from a wide spectrum of scholars, without reaching, nevertheless, a univocal consensus. Our scope is to disentangle the concept of poverty and the contribution of MNEs in this regard. For this reason, we focus on a specific form of poverty, i.e., lack of access to electricity, and on a specific type of MNE's presence, i.e., FDI. We argue that this impact could be affected by the institutional framework of both the destination country and the target country of the investment. For this purpose, we rely on several streams of literature. Specifically, institutional voids and MNE behavior (Khanna and Palepu, 1997; Boddewyn and Doh, 2011), institutional arrangement for the provision of infrastructure for public purposes (Levy and Spiller, 1994; Henisz, 2002), as well as the MNEs' legitimation mechanisms (Kostova and Zaheer, 1999; Zeng and Eastin, 2012).

The paper is organized as follows: section II describes the conceptual framework, section III presents the data and methodology, while sections IV and V illustrate the results and robustness checks, respectively. Finally, section VI reports the discussion and conclusion.

II. Conceptual framework

A. Infrastructure development in weak institutional environments: the role of MNEs and FDI

Reasons behind the shortage of access to electricity in developing countries are complex and vary across economies. However, one of the main cause can be imputed to the lack of adequate infrastructure for the production, distribution and transmission of electricity[16]. In SSA, the inadequacy of electricity system is mainly due to the reduction of investments in construction and maintenance of infrastructure, caused by the decline in state revenues and political stability, which involved most of the countries in the region since the seventies (Robbins and Perkins, 2012). This decrease of investments raises the area's dependence on infrastructure stocks heritage of colonial period, resulting in a qualitative and quantitative mismatching between supply and demand of infrastructure (Escribano et al., 2010).

More generally, the electric infrastructure system of a country is expression of its institutional environment and governments have always been involved in its provision or regulation (Williamson, 1976; Laffont and Tirole, 1991; Ostrom et al., 1993; Sawant, 2010). Namely, three features make electricity infrastructure a complex form of economic transaction, particularly sensitive to the country's institutional environment: (i) the high level of physical specificity of the investment (i.e., a high component of sunk investment); (ii) the widespread domestic consumption and; (iii) economies of scale and scope (Levy and Spiller, 1994). Following the framework provided by Bergara et al. (1998), four complementary institutional mechanisms could be identified that determine the profitability and feasibility of the investments. (i) Political stability, which enhances the potential for opportunistic behavior by governments. (ii) Administrative capabilities of the country, which represent the potential sophistication of the regulatory system and have a direct impact on the investment performances, due to the complexity of the infrastructure industry. (iii) Judicial independence and professionalism, which guarantees a more confident framework for enforcing formal constraints, offering credible commitment against arbitrary changes in the rule of the game and; (iv) credibility of regulatory

[16] Infrastructure refer to a range of facilities, services and installations that are essential for the distribution of products or services over geographic areas (Gómez-Ibáñez, 2009). Infrastructural assets usually comprise oil, gas, petrochemicals, electricity utilities, transportation, telecommunication, mining and other tangible, capital-intensive assets (Sawant, 2010).

system. Indeed, in countries where consultations and agreements between independent entities are needed for changing the status quo policies, the credibility of a regulatory policy is stronger because the rules proclaimed by a government cannot be changed unilaterally by the next one.

In the past forty years, the lack of strong and stable formal institutions has undermined the ability of developing country governments to provide or regulate electricity infrastructure for public purposes, deeply threatening their development opportunities (Robbins and Perkins, 2012). This has motivated other actors (e.g., the private - either profit or nonprofit – sector or interest group coalitions) to intervene to try to fill this institutional void, by supporting public agencies or substituting them (Boddewyn and Doh, 2011; Buckley and Boddewyn, 2015). In these circumstances, we claim that MNEs can be crucial in enhancing the provision of electricity in developing countries.

Since Caves (1974), empirical studies on the impact of MNEs on host countries have proliferated. On the one hand, scholars argue that MNEs are important sources of employment and marketable channels of technology, skills and knowledge transfer for the host country (Aitken and Harrison, 1999). From the achievement of economic development objectives, local governments expect positive impact on society (e.g., in term of quality of education or health system), and the reinforcement of local institutions (Weingast, 2002; North, 2005). In addition, some studies suggest that MNEs contribute also to social development of developing countries. Indeed, multinationals may raise the environmental, labor and safety standards and develop corporate social responsibility activities targeted to the local population (Kolk and Van Tulder, 2006).

On the other hand, studies have shown negative economic and social impacts stemming from MNEs presence in developing countries (Gunther, 2002). Some studies find that multinationals crowd out local firms and that technology, knowledge and skills transfers do not occur over the long-term (Aitken and Harrison, 1999). In addition, MNEs pollute the environment, exploit child labor, adopt inadequate safety standards and are not effective in alleviating poverty with their social initiatives (Oetzel and Doh, 2009). In this paper, we follow the first school of thought, and we argue that, under certain conditions, MNEs can have a positive and significant impact on the access to electricity for local population, by developing electricity infrastructure in developing countries where they invest and operate.

Although access to electricity could overall be assured through on-grid-systems, distributed mini-grid systems and, distributed off-grid systems (IEA, 2014)[17], we argue that MNEs can raise access to electricity only by providing the former two solutions. Thus, accordingly to Levy and Spiller (1994), only on-grid and mini-grid systems can be fully considered electricity infrastructure (see Table A.1 in Appendix). Our idea is corroborated by the findings of Sesan et al. (2013), where they show that an MNE that tries to introduce an off-grid system into the Nigerian market was not able to reach the target households. In addition, the engagement of MNEs in the development of electricity infrastructure can pass through four channels: planning, financing, construction (i.e., greenfield or repowering) and, operation and maintenance (Ostrom et al., 1993). It is important to specify that, based on the definition provided by Ostrom et al. (1993), by *planning* we refer to the decision process related to the definition of: (i) the type, quantity and quality of infrastructure that have to be provided; (ii) the degree to which private activities related to this infrastructure have to be regulated; (iii) how and where the construction of this infrastructure have to be arranged; (iv) how to finance it, and; (v) how to monitor its performance. In sum, planning is a key phase of electricity infrastructure development and the participation in it, through formal and informal relations with governments, can also be a viable option of engagement for MNEs. Table A.1 (Appendix) summarizes the characteristics of electricity provision, focusing on the SSA case.

Finally, the provision of electricity infrastructure by means of MNEs, may be related to the enterprise's market or non-market strategies[18] (Doh et al., 2012). In the case of a market strategy, MNEs develop electricity infrastructure as part of their core product/service or as part of the chain of activities responsible for delivering that product/service. A good example is the Electricité de France Group (EDF), a global leader in the power sector, which signed several agreements with national governments and other MNEs to cooperate in the improvement of the

[17] On-grid-systems are large and medium-sized power plants connected to large-scale international, national or regional grids. Distributed mini-grid systems are small sized plants. Distributed off-grid systems are stand-alone generators (IEA, 2014).

[18] Non-market strategies are the actions taken to favorably position the firm in its nonmarket environment by managing those uncertainties and resource dependences arising from the influence and/or resistance of other non-market actors that can affect the firm's overall economic performances (Mahon et al., 2004).

electrification rate in several sub-Saharan countries, such as Botwana, Mali, South Africa and Senegal. This has been done through the development of on-grid and mini-grid systems[19]. On the contrary, in other industrial sectors, MNEs need to supplement governmental activities in the provision of electricity infrastructure as part of their non-market strategies that, in these contexts, are essential to gain legitimacy that is necessary to countervail their liabilities of being a foreign as well as a profit-driven company. A good example is AngloGold Ashanti, a South African multinational mining company operating in Guinea that, as results of villagers' protests in 2012, built an electric power line from one of its mining plant to the nearby town, to gain legitimacy with villagers and guarantee their business activities[20].

Accordingly, our first hypothesis states as follows.

H1: MNEs are more likely to promote the access to electricity in countries that suffer from institutional voids than in countries with well-established institutions.

A. MNEs, legitimacy and liability of origin

Firms' organizational structures, policies, and practices tend to reflect the institutional environment in which they have been established (Zaheer, 1995). Accordingly, MNEs and FDI from institutionally developed countries (especially from Western economies) have been traditionally considered as generating spillovers in developing countries and creating the conditions for their long-term development (Hitt, Li, and Worthington, 2005). However, in the latest fifteen years, studies have shown that MNEs and FDI from institutionally weak countries can sometimes have higher positive effect than those from institutionally advanced economies (e.g., Javorcik and Spatareanu, 2011) revitalizing the debate over the factors that could moderate MNEs impact on host country development.

[19] See http://about-us.edf.com/strategy-and-sustainable-development/our-priorities/society/energy-access-developing-countries/projects-in-africa-84686.html and http://www.fres.nl/en/how-fres-works/fres-in-mali/86-10-jaar-ontwikkeling-in-mali-dankzij-zonne-energie.html (accessed on 26th March 2015).

[20] See http://ccsi.columbia.edu/files/2014/05/CCSI-Policy-Paper-Leveraging-mining-industrypercentE2percent80percent99s-energy-demand-to-improve-host-countrypercentE2percent80percent99s-power-infrastructure-Sept-20122.pdf (accessed on 13th July 2015).

One of the main arguments adopted to justify this ambiguity in results is that what matters are both the country institutional framework and the differences in institutional environments between host and home country. Institutional differences are multifaceted and refer to regulatory, cognitive, and normative institutions (Scott, 1995). They include differences in laws and regulations surrounding the acquisition of property; in licensing of new businesses; in domestic or international contracting for the acquisition of needed factors of production or for downstream sales; in protection of intellectual property; in payment of taxes, acquisition of government licenses and payment of fees; in prevalence of corruption and; in means and feasibility of market exit (Henisz, 2004). The greater the institutional differences between home and host environment, the more difficult is for the MNE to understand and correctly interpret local institutional requirements, as well as the extent of necessary adjustments (Kostova and Zaheer, 1999; Cuervo-Cazurra and Genc, 2008). This is more likely to be true when MNEs invest in countries affected by institutional voids, as the lack of strong institutions can challenge their conformity process (Ahlstrom et al., 2014; Young et al., 2014).

Under these conditions, MNEs that invest in countries affected by institutional voids can be advantaged if they come from an institutionally weak country, as managers already acquired at home the capabilities to survive and be successful under difficult institutional conditions (Eriksson et al., 1997; Cuervo-Cazurra, 2006). This ability could represent a competitive advantage for those MNEs, and can be strategically exploited in order to overcome the severe lack of legitimation, whereby these firms generally suffer with their stakeholders, e.g., local consumers, shareholders, current and future business partners and consumers in developed export markets (Ramachandran and Pant, 2010). Legitimacy is defined as the acceptance of the organization by its environment and it is essential to operate and succeed in a foreign context. All MNEs have to engage in activities to gain and maintain legitimacy in the widespread institutional settings in which they operate (Kostova and Zaheer, 2009). However, legitimation strategies are particularly important for MNEs from institutionally weak countries, as these firms generally bear their country of origin institutional environment, i.e., liability of origin effect (Ramachandran and Pant, 2010). This liability of origin comes from a negative stereotype that associates home country with weak institutions, weak firm governance that "does not provide to stakeholders adequate information for evaluating these firms" (Cuervo-Cazurra and Ramamurti, 2014 pp. 209-

211). In order to overcome this issue, MNEs from institutionally weak countries need to engage in alternative legitimation mechanisms and develop strategic responses instead of adapting passively (Kostova et al., 2008; Doh et al., 2012). For instance, Berliner and Prakash (2013) demonstrate that firms from corrupted countries adopt voluntary stringent environmental practices that go beyond the minimum requirements of the home or the host country laws, as they face discrimination from non-governmental organizations (NGOs), investors and potential business partners.

Under this perspective, we argue that, by leveraging on internal managerial expertise to countervail the fragility of governments, the development of electricity infrastructure can be employed by MNEs from institutionally weak countries as a legitimation strategy to alleviate local stakeholders' negative perception. Of course, some critical reflections are needed, as MNEs research of legitimacy could target only few powerful stakeholders, e.g., politicians or governmental officials (Hillman et al., 2004; Mellhai et al., 2015). This perspective goes beyond the paper aims, namely the analysis of the relationship between MNEs presence and access to electricity growth. Nevertheless, we acknowledge that one should refrain from an over-optimistic view of legitimation strategies, because attempts to gain recognition from and influence over a restricted set of local actors may come to alter local dynamics in the long term[21].

Finally, good evidences of our argument are provided by the Brazilian mining companies Vale and the Indian car manufacturing company Tata Corporation. These two companies are developing strong electrification programs in countries like Mozambique and Guinea, by leveraging on their familiarity with development challenges. The scope of these initiatives is to guarantee their business activities and to gain legitimacy at the international and national level. Thus, legitimacy could be essential for them to better penetrate in a region rich of natural resources and with a growing middle-class willing to spend money on consumer goods (Forstater et al., 2010).

Accordingly, our second hypothesis states as follows.

H2: In countries that suffer from institutional voids, MNEs from institutionally weak countries are more effective in promoting the access to electricity, compared to MNEs from well-established institutional environments.

[21] We would like to thank anonymous reviewers for stimulating us to further elaborate upon our findings.

III. Methods

A. Sample

For our study, an econometric analysis using a panel dataset has been performed. The sample is composed of pairs of 83 home countries and 15 host countries from sub-Saharan Africa, which are observed from 2005 to 2011. Table 1 reports the list of sample host countries and host-home country pairs, while Graph 1 is the network diagram of FDI stock per capita by home-host country pair. More details about FDI distribution between host and home country are presented in the rest of this section.

[Insert Table 1 about Here]

[Insert Graph 1 about Here]

Missing data proved to be an issue, but the problem has been faced by adopting statistical techniques (see the description of the single variables for more details) and this leads to a final sample size of 1,547 observations.

A. Dependent variable

Access to electricity. The dependent variable is the percentage of households with access to a minimum level of electricity consumption per year (Source: IEA). According to the definition provided by IEA, access to electricity involves more than the simple household connection to the grid; it also comprises consumption of a specified minimum level of electricity. The consumption threshold is computed by assuming five people per household and is set equal to 250 kilowatt-hours (kWh) per year for rural households and to 500 kWh per year for urban households (IEA, 2014). We are well aware that this proxy could overestimate the phenomenon, because it also includes non-infrastructure solutions for the provision of electricity, i.e., off-grid systems (see Table A.1), and could mainly refer to the supply side of electricity access. However, we believe that these two limitations could be overcome by including appropriate control variables, which capture factors that determine the electricity demand (e.g., variables that indicate the economic structure of a country and/or its income level) and the obstacles to the development of electricity infrastructure (e.g., rural population and population density).

Table 2 shows how access to electricity rate evolved in our sample host countries from 2005 to 2011. Overall the SSA region's access to electricity increased by 13 percent in 7 years. In our

sample, Namibia (+26 percent), Angola and Ghana (+23 percent), and Congo Republic (+18 percent) exhibit the highest growth rates, while the diffusion rate is observed in Congo Democratic Republic and Uganda (less than 15 percent). Further, in order to better qualify the SSA region's electricity sector, Table 2 reports the time trends of household electricity consumption and net electricity production for the sample host countries. Overall, both electricity produced and consumed by households increased from 2005 to 2011[22].

[Insert Table 2 about Here]

Graph 2 shows the overall growth in electricity consumption and its distribution across sectors, i.e., commercial and public services, households, manufacturing, construction and non-fuel industry, mining and quarrying, transports, and agriculture forestry and fishing, in 2005 and 2011. Overall, electricity consumption increased in the observed period, with the largest increase occurring in commercial and public services (30 percent) and households (25 percent). Increases in electricity consumption are likely to be related to an expansion of domestic production, as the correlation statistics of Table A.2 confirm (Appendix).

[Insert Graph 2 about Here]

The distribution of electricity consumption between different sectors does not appear to be coherent with a scenario where MNE effects in the electricity sector, if any, are concentrated in productive uses, and do not involve households. Commercial and public services, and households have been the only sectors that increased their weight by 1.3 and 1.2 percent, respectively, in the 2005-2011 period; while the share of electricity consumed by manufacturing and transports decreased by 1.3 and 0.9 percent, respectively. At last, household access to electricity rate is adopted as the dependent variable, instead of household electricity consumption, a variable that is moderately correlated to household access (0.454 and $p<0.01$, Table A.2). In fact, as households' access to electricity include a minimum consumption threshold for each connection to the distribution network, it is likely to capture poverty alleviation more thoroughly than country-level aggregate measures of electricity consumption[23].

[22] The only exceptions are Botswana and Democratic Republic of Congo where the electricity production remained stable or decreased over the period investigated.

[23] We would like to thank an anonymous reviewer for inviting us to better explain and contextualize the dependent variable.

Finally, to fill missing data (accounting for about the 30 percent of data), we adopt an approach that has been largely shown to present good statistical properties, i.e. multiple imputation (Allison, 2001). With multiple imputation, missing values are drawn from a distribution of observed variables, including the variables at stake, and can lead to consistent, asymptotically efficient, and asymptotically normal estimates (Allison, 2001). As the proportion of missing data is high and their pattern is arbitrary, we adopt the chained equations option (MICE), which uses a Gibbs-like algorithm to impute multiple variables sequentially using univariate fully conditional specifications (Raghunathan et al., 2001)[24]. In addition, in order to guarantee the consistency of imputed data, all the paired countries with less than three observations per variable, over the seven years, have been removed[25].

B. Explanatory variables

FDI per capita. The presence of MNEs in SSA countries is proxied by inward FDI stocks disaggregated according to home and host country, i.e., country-pair FDI (Source: UNCTAD). Since inward FDI stocks constitute an extensive variable, which varies on the basis of the country's size, and our dependent variable is expressed as a percentage of population, country-pair FDI per capita are employed (unit of measure: US dollars per capita). This variable is also affected by missing data (about 26 percent); thus, the treatment has been replicated by means of multiple imputation.

Table 3 illustrates the distribution of inward stock FDI in our sample, by home region, during the period considered.

[Insert Table 3 about Here]

From 2005 to 2011, MNEs from European Union have been the major investors in SSA (28 percent of total FDI), followed by North American ones (19 percent), South East Asian (15 percent) and sub-Saharan ones (11 percent). Chinese MNEs rank only sixth in terms of size of the investment, with a total amount of $19k per capita, which represent around seven percent of the total investments in our sample. It is worth noticing that in 2005, 80 percent of investment came

[24] The multivariate imputation using chained equations (MICE) is one of the most popular choices for dealing with arbitrary missing-value pattern and continuous variables, and is a valid alternative to Bayesian simulation methods (Lee and Carlin, 2010).

[25] The results of the multiple imputation are available upon request from the authors.

from only two regions, i.e., European Union (54 percent) and SSA (25 percent), while in 2011, the FDI origin was much more diversified. In particular, a greater presence in SSA is observed for North America (25 percent), South East Asia (22 percent), Latin America and Caribbean Sea (11 percent) and China (9 percent), while investments from European Union and other SSA countries represented only the 17 percent and 6 percent of total inward FDI stock, respectively [26].

Institutional quality of host and home countries. The institutional quality of a country has been measured through the six World Bank's Worldwide Governance Indicators (WGIs): regulatory quality, control of corruption, voice and accountability, rule of law, governance effectiveness and, political stability and the absence of violence and terrorism. The WGIs have been used extensively in academic research. Winters and Martinez (2015), for instance, find that 8 out of 19 studies that examine governance as a determinant of foreign aid use WGIs. All the six indicators are used, because choosing only a few of the WGIs to model the institutional quality would be highly discretionary. In addition, as shown in Table 4, a conceptual link has been identified between each WGIs and the institutional dimensions that are relevant for the provision of electricity infrastructure (for further details, see section II). However, the correspondence is not univocal[27].

[Insert Table 4 about Here]

The high correlation between these variables (more than 95 percent in some cases), their correspondence to multiple theoretical constructs, and in line with previous literature (e.g., Farla et al., 2014), a factorial analysis is performed in order to obtain a unique indicator. Thus, a factor has been built for host countries and another for home countries over the 2005-2011 period, by means of the principal-component analysis method (Hotelling, 1936). Table A.3 in Appendix shows the factor analysis results. There is only one single dominant factor that summarizes the WGIs, and it can explains more than 84 percent (for home countries) and 86 percent (for host

[26] FDI per capita from Chinese firms amounted only to $72 per capita (0.6 percent of total amount) in 2005, while they reached a pick of $15k per capita in 2011.

[27] The government's ability in directly providing electricity to the population has been proxied by the government effectiveness variable. Administrative capabilities have been proxied by the rule of law and, voice and accountability variables. Credibility of regulatory system has been measured by the government effectiveness, regulatory quality, and control of corruption. Judicial independence and professionalism by the control of corruption, rule of law and, voice and accountability variables. Finally, political stability has been proxied by the variable with the same name.

countries) of the six institutional dimensions. Table A.3 also shows that each of the components loads very high into their respective factor and has a low value of uniqueness, meaning that the two factors explain well the WGIs for home and host countries.

Finally, Table 5 illustrates how the institutional quality changed in each host country and in the home countries aggregated by regions, from 2005 to 2011. The institutional quality of host countries (*institutional quality host*) undergoes a slight deterioration in the SSA region as a whole (- 0.04). Countries with the weakest formal institutions are Congo Democratic Republic, Eritrea and Angola, while Botswana and Mauritius, which are respectively 1.06 and 1.16 points over the regional average, host the strongest institutions. On the other side, the institutional quality of home countries (*institutional quality home*) decreased (-0.12). As expected, European Union, North America and Oceania lie at the opposite side of SSA (-1.12) and India (-1.04), while China could be considered a lower-middle country as for institutional quality (0.82 points under the worldwide average). Home regions that experienced the strongest reduction in the institutional quality have been North Africa and Middle East (-0.30) and South East Asia (-0.17).

[Insert Table 5 about Here]

C. Control variables

In order to reduce the risk of spurious correlations, we control for the following host-country specific characteristics.

Population. This variable allows controlling for the host country size and it is expressed in millions of people. (Source: World Bank).

Rural population. Only 37 percent of the sub-Saharan population lives in urban areas[28]. This raises barriers to the access to electricity, as the deployment of electricity infrastructure is more difficult and costly outside cities and their outskirts (IEA, 2014). For this reason, we control for the share of rural population in the host country, expressed as a percentage of the total population (Source: World Bank).

[28] See http://data.worldbank.org/data-catalog/world-development-indicators accessed on 22nd of March 2016.

Population density. Like the rural population, the low population density, i.e., people per square kilometer per land area (Source: World Bank), is also a barrier to the diffusion of electricity access, especially through national or regional grids (Crousillat et al., 2010).

Income level. Two dummies, i.e., low-income (LIC) and lower middle-income (LMIC) countries, are used to model the income group to which the host country belongs, as defined by the World Bank. Host countries that are neither LIC nor LMIC are upper middle-income (UMIC) and represent our baseline. We prefer to use income-class binary variables instead of using a full-scale income measure, e.g. gross domestic product (GDP) per capita, to show any dependence of FDI effects on the country income in a more self-explanatory way. However, as a robustness check we run our model by replacing income dummies with GDP per capita (see section V).

Industry and services value added. These two variables aim to control the host country's economic structure (Source: World Bank). Industry value added, expressed as a percentage of GDP, covers mining, manufacturing, construction, electricity, water and gas. Services value added, also expressed as a percentage of GDP, comprises wholesale and retail trade (including hotels and restaurants), transport, government, financial, professional and personal services, such as education, health care, and real estate services. The two variables obviously take on a low value if the country is specialized in agriculture, husbandry, forestry and fishing.

Time and country-pair dummies. These dummies are included in the model to capture unobservable factors that may drive changes in the access to electricity rate and country-pair FDI. On one side, country-pair fixed effects control for unobservable mutual linkages that can affect the degree of involvement of MNEs into the development of electricity infrastructure in host countries (e.g., bilateral agreements or political alliances). On the other side, time fixed effects control global or regional shocks that may change the ability of all the host countries to attract FDI and to diffuse the access to electricity (e.g., price crisis for metal commodities or global recessions).

D. Model

For our study, we adopt a growth model often used by institutional scholars (e.g., Henisz and Zelner, 2001), which has the following form:

$$(1) \quad \Delta y_{i,t} = \alpha_0 + (\alpha - 1) y_{i.t-1} + x'_{i,t}\,\beta + \chi_i + \varphi_t + \varepsilon_{i,t}$$
$$for\ i = 1, \dots, N\ and\ t = 2, \dots, T$$

We operationalize this model as specified in Equation (2).

$$(2) \quad \Delta Access\ to\ Electricity_{\,i,t} =$$
$$\alpha_0 + \alpha_1\ Access\ to\ Electricity_{\,i,t-1} +$$
$$+ \beta_1\ FDI\ per\ capita_{\,i,j,t-1} + \beta_2\ Institutional\ quality\ host_{\,i,t-1} +$$
$$+ \beta_3\ Institutional\ quality\ home_{\,j,t-1} +$$
$$+ \gamma\ Z'_{i,t-1} + \delta\ D'_{i,t} + \varphi_t + \chi_{ji} + \varepsilon_{i,j,t}$$

Finally, the model is extended by introducing two interaction terms as showed in Equation (3).

$$(3) \quad \Delta Access\ to\ Electricity_{\,i,t} =$$
$$\alpha_0 + \alpha_1\ Access\ to\ Electricity_{\,i,t-1} + \beta_1\ FDI\ per\ capita_{\,i,j,t-1} +$$
$$+ \beta_2\ Institutional\ quality\ host_{\,i,t-1} +$$
$$+ \beta_3\ Institutional\ quality\ home_{\,j,t-1} +$$
$$+ \beta_4\ FDI\ per\ capita_{\,i,j,t-1} * Institutional\ quality\ host_{\,i,t-1}$$
$$+ \beta_5\ FDI\ per\ capita_{\,i,j,t-1} * Institutional\ quality\ home_{\,j,t-1} +$$
$$+ \gamma\ Z'_{i,t-1} + \delta\ D'_{i,t} + \varphi_t + \chi_{ji} + \varepsilon_{ij,t}$$

Where i is the host country, j is the home country, t is the year, ϕ_t and χ_{ji} are the unobservable year and country-pairs fixed effects, respectively; $\varepsilon_{ij,t}$ is the i.i.d. disturbance term. $Z'_{i,t-1}$ is vector of controls, i.e., population, rural population, population density, industry and services value added, while $D'_{i,t-1}$ is the vector of LIC and LMIC dummies.

Δ*Access to electricity*$_{i,t}$ is the yearly increase in the percentage of households with access to electricity between time t-1 and t (i.e., *access to electricity*$_{i,t}$ - *access to electricity*$_{i,t-1}$). *Access to electricity* $_{i,t\text{-}1}$ is the lagged dependent variable in level, which allows to control for the dynamics of the process. Finally, in order to alleviate potential reverse causality problems, we lag the explanatory variables and controls by one period. We adopt a one-lag model specification as it is typical of growth models (Henisz and Zelner, 2001) and because we want to preserve the maximum possible number of degrees of freedom available for the estimates. However, the inclusion of only one lag among regressors does not constrain the process dynamics to a short transient, as recalled in the following paragraphs.

The introduction of the interaction terms requires the evaluation marginal effects by means of Equations (4) and (5). The former simulates the effects of FDI in an institutionally weak host country, given the quality of home institutions at the mean level. The latter simulates how, setting the quality of host institutions at the minimum value, the effect of FDI varies when the quality of the home institutions decreases from a minimum to a maximum level.

(4) $$\left.\frac{\partial(\Delta\text{Access to electricity}_{i,t})}{\partial(\text{FDI per capita}_{i,j,t-1})}\right|_{\substack{(Inst.\ quality\ host_{i,t-1})_{min} \\ (Inst.\ quality\ home_{j,t-1})_{mean}}} =$$

$$\beta_1 + \beta_4(Inst.quality\ host_{i,t-1})_{min} + \beta_5(Inst.quality\ home_{j,t-1})_{mean}$$

(5) $$\left.\frac{\partial(\Delta\text{Access to electricity}_{i,t})}{\partial(\text{FDI per capita}_{i,j,t-1})}\right|_{\substack{(Inst.\ quality\ host_{i,t-1})_{min} \\ (Inst.\ quality\ home_{J,t-1})_{min}}} - \left.\frac{\partial(\Delta\text{Access to electricity}_{i,t})}{\partial(\text{FDI per capita}_{i,j,t-1})}\right|_{\substack{(Inst.\ quality\ host_{i,t-1})_{min} \\ (Inst.quality\ home_{J,t-1})_{max}}} =$$

$$+ \beta_5\left[(Inst.quality\ home_{j,t-1})_{min} - (Inst.quality\ home_{j,t-1})_{max}\right]$$

However, these are only the short-term effects; whenever $\alpha_1 < 1$, also the long-term effect of FDI on the access to electricity growth can be estimated. For the sake of exposition, formulas on the long-term calculation are given for the model presented by Equation (4); generalization to the model presented by Equation (5) are straightforward. Since the effect after T periods is given by $\lambda^T = \left[\beta_1 + \beta_4(Inst.quality\ host_{i,t-1})_{min} + \beta_5(Inst.quality\ home_{j,t-1})_{mean}\right] * \sum_{l=0}^{T}(\alpha_1 + 1)^l$, the long-term effect is given by the following expression:

$\lambda = \lim_{T\to\infty}\lambda^T = -\frac{\left[\beta_1 + \beta_4(Inst.quality\ host_{i,t-1})_{min} + \beta_5(Inst.quality\ home_{j,t-1})_{mean}\right]}{\alpha_1}$ (see also Garrone and Grilli, 2010).

According to the literature on dynamic panel data, the system Generalized Method of Moments, i.e., system GMM (Arellano and Bover, 1995; Blundell and Bond, 1998), and the corrected Least Square Dummy Variables, i.e., corrected LSDV (Kiviet, 1995; Bruno, 2005), estimators are used.

The System-GMM allows dealing with the endogeneity problems due to the lagged-dependent variable, and the potential correlation of the explanatory variables with the error term. This estimator instruments the lagged-dependent variable and any other similarly endogenous variables with variables that are uncorrelated to the fixed effects, thus dramatically improving

efficiency of the estimates (Roodman, 2009)[29]. The two-step method results in more asymptotically efficient estimates than the one-step (Baltagi, 2005), and the bias in the standard errors is fixed by means of Windmeijer's (2005) correction procedure. In addition, we control for the endogeneity of lagged-dependent variable, *FDI per capita, institutional quality host, industry* and *services value added, LIC* and *LMIC* variables. The variables *population*, *rural population* and *population density* are considered pre-determined. *Year dummies* and *institutional quality home* are dealt as exogenous. Finally, some external instruments is added and treated as predetermined, i.e., the degrees of a country's globalization, social development and other aspects of economic development not inserted into the model. In fact, infrastructure and development are linked by a two-way relationship. Infrastructure enables social and economic development, through households' improved welfare, higher levels of income and consumption, reduced private costs, and saved time (Bryceson and Howe 1993; Khandker et al. 2009). Furthermore, they help social inclusion through increased social mobility (Kirubi et al., 2009) and stimulate country's globalization (Sapkota, 2011). At the same time, globalization and social and economic development spurs further demand for infrastructure services, and economic growth also helps to increase the quality and quantity of infrastructure services through increased investments in infrastructure development. In order to capture this phenomenon, the level of a country's globalization is proxied by means of the *KOF index of globalization* introduced by Dreher (2006), from the KOF Swiss Economic Institute. Levels of social development and inclusion are proxied by means of the *human flight and brain drain* and *group grievance* variables (Source: Fund for Peace). Finally, economic development is expressed by the *poverty and economic decline* variable that aggregates dimensions such as unemployment, youth unemployment, economic deficit, government depth, inflation, purchasing power and GDP growth (Source: Fund for Peace)[30].

[29] The First-differenced GMM estimates of dynamic panel growth models may be biased because lagged levels of the variables are only weak instruments for subsequent first differences, if the time series are persistent and the number of time series observations is small; for this reason, the system-GMM estimator is preferable (Bond et al., 2001).

[30] The Human Development Index (HDI), developed by the World Bank, has also been considered as an external instrument to capture economic and social development. However, due to the high amount of missing data, i.e., 25 percent, we prefer not to use it.

In addition, the corrected LSDV is also used to estimate the regression coefficients (Kiviet, 1995; Bruno, 2005). This estimator has the drawback of relying on the assumption that all other regressors other than the lagged-dependent variable are uncorrelated to any time-varying unobserved heterogeneity. However, its advantage is that it corrects the endogeneity bias of the lagged-dependent variable without the use of any instruments. In recent studies this estimator emerged as one of the most accurate to cope with panel datasets, even under the condition of endogenous regressors, especially when there is the risk of unobserved heterogeneity and second order serial correlation, as in our case (Flannery and Hankins, 2013).

E. Descriptive Statistics and Correlations

Table 6 shows the correlation matrix and the descriptive statistics of the model variables. The overall pattern of our variables does not reveal a tendency toward multi-collinearity. However, as expected the access to electricity rate is highly correlated with quality of institutions, country's economic structure, level of economic development and population density. In addition, it can be observed that *access to electricity* varies from the worst case for the Republic Democratic of Congo, where only 5.8 percent of the population has access to electricity in 2005 and 2006, to the best case of Mauritius, where, in 2010, 100 percent of the population has access to electricity.

The *institutional quality host* factor is positively correlated with the host country income (i.e., *GDP per capita host*), on the economy bias toward services, population density and inward stock FDI per capita ($p<0.01$), and is negatively correlated with the size of the population and the rate of rural population ($p<0.01$). The *institutional quality home* factor is positively correlated with the home country income ($p<0.01$) and with *FDI per capita* ($p<0.1$).

[Insert Table 6 about Here]

IV. Results

Tables 7 and 8 present estimates obtained with the system-GMM and the corrected LSDV estimators. Specifically, Table 7 contains six Models computed with the system-GMM. Model 1 is the baseline that contains only control variables and the lagged-dependent variable in level. Explanatory variables and interaction terms are added one-by-one while moving from Model 2 to

Model 6. For the sake of brevity, Table 8 reports only the corrected LSDV estimates for the most complete model[31].

The present section is organized as follows. Estimates for the explanatory variables and interaction terms are commented on first. Then the evidence related to the control variables is summarized. Finally, results of the marginal effects are discussed.

[Insert Table 7 about Here]

[Insert Table 8 about Here]

In all the Models in Tables 7 and 8, the lagged-dependent variable in level (*access to electricity*$_{i,t-1}$) is negative and significant. This means that the higher the access to the electricity rate at time t-1, the lower the growth rate of the access to electricity at time t. However, with the corrected LSDV estimator, even though the coefficient of the lagged-dependent variable in level is negative, it is close to 1 (magnitude of -0.9627 and $p<0.001$); this indicates that there is the risk that the model does not converge, leading to spurious estimations. In order to strengthen the results, stationarity tests are conducted for the *access to electricity* variable, i.e., the unit root tests. The methods developed by Im, Pesaran and Shin (2003) and Levin, Lin and Chu (2002), i.e., the so-called IPS and LLC tests, are used for this purpose. A global time trend is considered, because the variable has a significant correlation with time, and the series are demeaned, since there is no precise conjecture about the cross-country correlation. Unit root tests reveal that the *access to electricity* variable is stationary, which means that the results obtained with corrected LSDV are robust[32].

The *institutional quality host* variable is added to Model 2 in Table 7. In line with our conceptual framework, local institutions raise access to electricity ($p<0.1$). The *FDI per capita* variable is added to Model 3 in Table 7 but there is no evidence of its impact on the access to electricity growth (i.e., Δ*Access to electricity)*. However, when the interaction between *institutional quality host* and *FDI per capita* variables is included (Model 4 of Table 7), we find that FDI increase the access to electricity when the host institutions are weak, since the coefficient of the interaction term is negative and significant ($p<0.05$). In Model 5, the *institutional quality home* variable is added, but not significant impact is found. Finally, Model 6 in Table 7 and Model 1 in Table 8

[31] The results of the intermediate models are available upon request from the authors.

[32] The results of the Unit Root tests are available upon request from the authors.

displays results obtained with the system-GMM and the corrected LSDV estimators, respectively, for the most complete model where all the explanatory variables the interaction terms are considered. The estimates confirm that FDI foster access to electricity in countries affected by institutional voids. Hence, the coefficient of the interaction term *FDI per capita*Institutional quality host* is negative and significant with both, system-GMM ($p<0.05$) and corrected LSDV ($p<0.1$) estimators. Furthermore, the corrected LSDV estimator shows that this impact becomes stronger when the FDI comes from institutionally weak countries, i.e., the coefficient of the interaction term *FDI per capita*Institutional quality home* is negative and significant ($p<0.01$).

Most of the control variables maintain a steady sign and significance with the system-GMM across all the models (see Table 7). Some slight differences emerge with the results obtained with the corrected LSDV (Table 7)[33]. One possible interpretation of this partial overlap is that the latter estimator assumes all the variables, except for the lagged dependent one, to be exogenous. It can be seen that *population* and *population density* have a positive and significant impact on *ΔAccess to electricity* ($p<0.01$ for both variables). This means that, as expected, the size of the country and the level of the urbanization positively affect access to electricity growth, mainly because, as urban economists suggest, "the provision of many public services and facilities, such as schools, hospitals, utilities, and highways" and thus electricity infrastructure, "typically exhibits the characteristic of economies of scale" (Fujita, 1989 p.135). On the contrary, *rural population* is confirmed to be a barrier to the diffusion of access to electricity ($p<0.01$). In fact, in countries with low domestic saving rates and tax revenues, and a high percentage of rural population, such as sub-Saharan countries, the development of large national or regional grids is inefficient (IEA, 2014). For this reason, specific strategies and technical solutions should be considered for rural communities, e.g., off-grid or mini-grid (see Table A.1). As expected, the level of economic development of the host country has an important effect on Δ*Access to electricity*. Historical records in fact show that when households increment their income, they first use it for heating and lighting, in addition to food, education and health (Paul and Bhattacharya, 2004). For this reason, it is not surprising that the *LIC* dummy has a negative and highly significant impact on

[33] Compared with values obtained with system-GMM, with the corrected LSDV estimates of *population density, industry* and *services value added* have the same sign but are not significant, while *population* is not significant with an opposite sign.

Δ*Access to electricity* ($p<0.01$), while the coefficient of the *LMIC* dummy is negative but not significant. Moreover, we find only evidence for the positive impact of the *services value added* ($p<0.05$), while we do have results on the role of the *industry value added* variable. Therefore, it is reasonable to assume that a higher level of valued added in services would correspond to a higher economic development, which in turn would foster access to electricity (Medlock and Soligo, 2001).

Specification tests have been done to detect possible autocorrelation and over-identification problems in the six system GMM models (Table 7) The tests for autocorrelation indicate that the model is well specified (see AR(1) and AR(2)), and Hansen tests confirm the validity of our instruments.

In addition, in order to test our hypotheses, we compute FDI marginal effects on the access to electricity growth, by means of Equations (4) and (5). Results are presented in Table 9.

In line with our conceptual framework, the first row of Table 9 illustrates that, based on both estimators, FDI would enhance access to electricity growth, when host institutions are weak (Equation (4)). H1 is confirmed at a standard significance level ($p<0.05$). We also find that the quality of home institutions may matter (second row of Table 9). We find that FDI might stimulate the access to electricity growth in host countries with underdeveloped institutions, if the quality of home institutions decreases from maximum to minimum levels (Equation (5)). H2 is confirmed only by one of the two estimators, i.e., corrected LSDV, at a standard significance level ($p<0.001$). However, we are confident about our results as in recent studies this estimator emerged as one of the most accurate for panel data analysis (Flannery and Hankins, 2013) .

[Insert Table 9 about Here]

In addition, in order to understand more in depth how the institutional quality of home and host countries moderates the impact of FDI, Graphs 3 and 4 simulate the response over time of access to electricity to an inward FDI stock shock, under different institutional scenarios. Namely, starting from a stationary condition, at time t=0 and access to electricity at its mean (59.91 percent, Table 6), we give a shock to the FDI per capita, equals to its standard deviation (1496.38 $ per capita, Table 6), and we see how the model presented in Equation (3) reacts over time, up to T (where T=10). The calculation of response over time is explained in section III (E. Model; see λ definition). Graph 3 simulates the response over time under three scenarios for the quality of

host institutions (minimum, mean and maximum). The largest benefit from MNEs' presence accrues to countries with weak institutions (H1). Similarly, Graph 4 simulates the response over time in host countries with weak institutions, given three levels of home country institutional quality. Even in this case, it is apparent that the most beneficial FDI are those from low-institutional quality countries (H2).

[Insert Graph 3 about Here]

[Insert Graph 4 about Here]

We are aware that some cautions is needed in reporting our results, as they are contingent to our specification, in particular to the proxies used to measure quality of institutions. Indeed, despite the use of WGI is in line with similar studies (e.g., Winters and Martinez, 2015), these indicators describe only antecedents of institutional voids and do not give information about mechanisms through which FDI fill these voids. To overcome this limitation a firm level analysis would be needed. However, this goes beyond the scope of the paper. Additionally, in order to better understand how the impact of FDI is modeled by the quality of institutions, the model has been also run using the single WGIs instead of the institutional *quality host* and *home* factorial variables. Most models based on single indicators confirm our core results. As regards control of corruption in the host country, its role is uncertain and this does not allow us neither to confirm nor to exclude that bribery is a driver of MNEs involvement in electrification, opening questions for future researches[34]. Finally, some caution is also needed because of the amount of data imputation done, a limitation that we partially try to overcome by running several robustness checks, as described in the following section.

V. Robustness checks

Robustness of our findings has been tested in several ways. Whenever not reported, robustness test results are available upon request from the authors.

First, we use a different indicator for the dependent variable. When we talk about access to electricity, we are more generally talking about access to modern energy services. Based on the definition provided by the IEA, modern energy services include not only electricity but also the adoption of clean and safe biomasses for cooking. These modern biomasses refer to biogas systems, liquefied petroleum gas (LPG) stoves and improved biomass cooking stoves, which have

[34] Results of single Worldwide Governance Indicators are available upon request from the authors.

lower emissions and higher efficiency than traditional three-stone fires, widely used for cooking in developing countries (IEA, 2014). For this reason, our first robustness test consists in running our model by replacing the *access to electricity* variable with *use of traditional biomass* variable, which has also the advantage of a lower number of missing data, i.e., 16 percent (Source: IEA). As expected, the two variables are highly and negatively correlated (magnitude of -0.86 and $p<0.01$), and this reinforces the validity of the *use of traditional biomass* as an alternative dependent variable, even from an empirical point of view. Table 10 shows findings obtained with the system-GMM and the corrected LSDV estimators, while Table 11 reports the marginal effect estimates. Our results are confirmed only by means of the corrected LSDV estimates. A possible explanation of this partial overlap with results of Table 9, could be that in certain countries there might exist genuine differences between a large access to electricity and the abandon of traditional biomasses as an energy source, e.g., wood fuel might still be used in electrified households. However, the corrected LSDV estimator is likely to be more suitable for datasets as ours (Section III.E; Flannery and Hankins, 2013), strengthening our confidence in this first robustness check (see Table 9).

[Insert Table 10 about Here]

[Insert Table 11 about Here]

Another test consists in replacing the institutional quality variables drawn from the WGIs with variables constructed with six institutional indicators developed by the Fund-for-Peace (FFP). The six indicators considered are state legitimacy, state's ability to provide public services, presence of factionalized elites, interventions from external actors, human rights, rule of law and security apparatus[35]. According to the FFP's guidelines, a unique variable, i.e., *political strength,* is built, one for the home and another for the host countries. This variable is the inverse of the sum of the six previously mentioned indicators; it ranks from 1 to 60. Tables 12 and 13 show the results obtained when this new proxy of the institutional quality is adopted and the calculated marginal effects. The results are perfectly in line with our core evidences (see Table 9).

[Insert Table 12 about Here]

[Insert Table 13 about Here]

[35] See: http://fsi.fundforpeace.org/ (accessed on 22nd March 2016).

It is widely recognized that in SSA, FDI are significantly driven by the presence of natural resources (Asiedu, 2006). However, this aspect is not considered in our model (see section III), due to the high correlation with the country's economic structure, i.e., *industry* and *services value added* variables. For this reason, as a third robustness check, the host country's economic structure is replaced by the presence of natural resources, measured by the *natural resources rents* variable, expressed as a percentage of GDP (Source: World Bank)[36]. Even in this case, our results are confirmed, adding robustness to the analysis.

We conduct a further check by replacing the two income dummies (LIC and LMIC) with the continuous variable GDP per capita (constant 2005 US$) sourced from the World Bank Development Indicators. In this case, H1 is confirmed only by means of system-GMM estimator, while H2 by means of corrected LSDV.

Since missing values are an issue in our empirical dataset, we attempt to run our model without performing multiple imputation for the *access to electricity* and *FDI per capita* variables. Even in this case H1 is confirmed by the system-GMM estimator (magnitude of 0.046 and $p<.05$), while with the corrected LSDV estimator results for H2 have the same sign as those obtained after multiple imputation, but the significance is weakened ($p=0.113$). We are not able to conclude whether this weakness is due to a potential bias introduced in the analyses by missing value treatment or to the reduction in size of our sample (from 1547 to 1004 observations)[37].

Furthermore, we formally test the role played by FDI from China (with Hong Kong) and European Union in our analyses, given the major presence of the two players in SSA. To the aim of a sensitivity analysis, we run our model (3) (section III) by removing the observations of European Union FDI from the sample. We re-run it by removing the observations of China FDI from the sample. In both cases, H1 is confirmed by the system-GMM estimator ($p<0.1$) and H2 is confirmed by the corrected LSDV ($p<0.5$)[38]. Overlapping with our main results is only partial (see

[36] Natural resources rents are the sum of oil, natural gas, coal (hard and soft), mineral and forest (See http://data.worldbank.org/indicator/NY.GDP.TOTL.RT.ZS, accessed on the 4th June 2015).

[37] We would like to thank for comments provided on the treatment of missing data, and suggestions to test the stability of the results.

[38] We would like to thank an anonymous reviewer for suggestions provided on the sensitivity analysis, and suggestions to test the stability of the results.

Table 9). A possible explanation could be that removing important groups of countries, especially European Union, dramatically reduces the size of our sample (from 1547 to 952 observations), weakening our estimates. Alternatively, it would be possible that observed phenomenon is partially driven by specific countries or group of countries, a topic that is left for future investigation.

Finally, we are aware that reverse causality might certainly be an issue in our setting. Economists, politicians and business leaders routinely call developing countries, especially in SSA, for infrastructure development as a strategy to attract FDI to the local economy (Wheeler and Mody, 1992; Ansar, 2013). In order to rule out this and other forms of endogeneity, a reverse causality analysis is performed. Causality is confirmed to run from FDI inwards to access to electricity and, not the other way around, strengthening the interest of our findings.

In conclusion, as summarized by Table A.4 in Appendix, most of the robustness checks confirm both H1 and H2, at least with one of our estimators. The absence of reverse causality, the convergence of estimates with alternative indicators of modern energy access and institutional quality are particularly encouraging. Analyses of the sensitiveness of our results to the role of single home countries (European Union countries and China) and to the imputation of missing data returned mixed confirmations, also because these checks implied a reduction of the sample size. While improved and extended datasets will enable a more in depth analysis of these issues, the additional controls made in this section strengthened our overall confidence in the results of section IV.

VI. Discussion and conclusion

Electricity is a marker for development (Dinkelman, 2011); however, access to affordable, reliable, sustainable, and modern energy is far from being universal in developing countries, as made clear by the Seventh SDG of the 2030 Agenda of United Nations. Using a panel of more than 1547 home-host country pairs, observed from 2005 and 2011, our study aims to investigate those institutional conditions that moderate the impact of MNEs and FDI on the access to electricity of local population in SSA. Our findings, robust across several specifications and checks, show that in countries affected by institutional voids, MNEs can promote access to electricity, and this is more likely when they come from institutionally weak countries. Reasons could be many. First, MNEs need electricity for their business activities (Khavul and Bruton, 2013). Thus, it

is reasonable to assume that MNEs raise access to electricity mainly by developing electricity infrastructure, as these assets are essential for their daily activities. However, infrastructure can also be employed as legitimation strategy with their stakeholders (Oetzel and Doh, 2009). In fact, we find that FDI from institutionally weak countries are more likely to increase access to electricity. We argue this is due to the fact that those MNEs generally suffer from a higher lack of legitimacy, compared with companies from highly institutionally developed economies (Cuervo-Cazurra and Ramamurti, 2014). At the same time, they are already familiar with difficult institutional conditions, and know how to deal with the lack of provision of electricity by local governments (Cuervo-Cazurra and Genc, 2008; Boddewyn and Doh, 2011).

On a long-term perspective, it would be interesting to study what happens when quality of institutional context of both host and host country improves. We assume that MNEs and FDI would still be important to the local context development, as the elimination of all institutional voids is improbable. However, they will tend to develop strong cooperation with local market and non-market actors, such as public agencies, NGOs or private suppliers of electricity (Buckley and Boddewyn, 2015); more investigations, nevertheless, would be needed in this direction.

We believe that with the present work we make an important contribution to the on-going debate on the impact of MNEs and institutions on poverty alleviation in developing countries (Kolk and Van Tulder, 2006; Sesan et al., 2013; Ahlbord et al., 2015), by showing contingencies that could accelerate their electrification process. Namely, we add to the institutional economics literature (Williamson 1976; Bergara et al., 1998; Henisz 2002). Indeed, our empirical evidence confirms that private sector performances, in terms of long-term and context-specific investment, are highly contingent to a country's institutional environment. These results raise some questions, as they are in contrast with the common idea that private enterprises are supposed to underinvest in countries where formal institutions are too weak to limit governmental opportunism (Levy and Spiller 1994). For this reason, we suggest that some further reflections and in-depth case studies would be required in the future.

Our work is not immune from limitations that, nevertheless, pave the way to further investigations. First, multiple imputation is required to fill missing data. As consequence, some caution is needed in interpreting our empirical findings also because the level of significance varies across specifications. Second, the available stream of data does not allow us to distinguish

between FDI in different sectors. Furthermore, only strong regulatory and formal institutions are considered while we know that also informal ones are important for infrastructure, particularly in developing countries (Ostrom et al., 1993). Finally, our empirical results rely on proxies that describe country-level antecedents of institutional voids. For this reason, a broader analysis of MNEs impacts would certainly benefit from data at the corporate or community level. This could help to study more in-depth the mechanisms through which MNEs fill institutional voids, and to better identify targeted stakeholders. For this reason, a more micro-level analysis ranks high in our research agenda.

In conclusion, the scope of the paper is to provide policy recommendations to both public, i.e., policy makers of developing countries, and private sector, i.e., MNE managers. Indeed, an analysis of the conditions that make a private investment effective in terms of energy poverty alleviation is fundamental to understand which type of MNEs should be attracted and to guide the development and implementation of specific energy policies in each country. At the same time, this paper should also concern MNEs themselves. In fact, these companies are under constant pressure to continuously increase shareholder returns. In order to achieve this objective, MNEs need to increase their investments in developing countries and participate in their long-term growth and prosperity (Oetzel and Doh, 2009; Gratton, 2014). In this perspective, the enhancement of access to electricity could be a viable strategy to create the conditions for settling-in durable and profitable new business activities in these countries.

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Table 1. Sample: home-host country pairs and host countries

Home - Host Country Pair								SSA Host Countries
Angola	SouthAfrica	France	Congo	Luxembourg	SouthAfrica	Spain	Mauritius	Angola
Argentina	SouthAfrica	France	Gabon	Madagascar	SouthAfrica	Spain	SouthAfrica	Botswana
Aruba	SouthAfrica	France	Ghana	Malawi	SouthAfrica	SriLanka	Mauritius	Cameroon
Australia	Ghana	France	Kenya	Malaysia	Mauritius	Swaziland	Botswana	Congo
Australia	Mauritius	France	Mauritius	Malaysia	SouthAfrica	Swaziland	SouthAfrica	DemRepCongo
Australia	SouthAfrica	France	SouthAfrica	Maldives	SouthAfrica	Sweden	Ghana	Eritrea
Austria	Mauritius	France	Uganda	Malta	Mauritius	Sweden	Mauritius	Ethiopia
Austria	SouthAfrica	Germany	Ghana	Malta	SouthAfrica	Sweden	SouthAfrica	Gabon
Bahamas	Mauritius	Germany	Kenya	Mauritius	Botswana	Sweden	Uganda	Ghana
Bahamas	SouthAfrica	Germany	Mauritius	Mauritius	Ghana	Switzeland	SouthAfrica	Kenya
Bahrain	SouthAfrica	Germany	SouthAfrica	Mauritius	SouthAfrica	Switzerland	Botswana	Mauritius
Belgium	Angola	Ghana	SouthAfrica	Mauritius	Uganda	Switzerland	Ghana	Namibia
Belgium	Cameroon	Greece	SouthAfrica	Morocco	Cameroon	Switzerland	Kenya	Nigeria
Belgium	Congo	HongKong	Botswana	Morocco	Congo	Switzerland	Mauritius	SouthAfrica
Belgium	DemRepCongo	HongKong	Mauritius	Morocco	Gabon	Taiwan	SouthAfrica	Uganda
Belgium	Gabon	HongKong	SouthAfrica	Mozambique	SouthAfrica	Tanzania	SouthAfrica	
Belgium	Kenya	Hungary	SouthAfrica	Namibia	SouthAfrica	Thailand	SouthAfrica	
Belgium	Mauritius	Iceland	SouthAfrica	Netherlands	Angola	Togo	Ghana	
Belgium	SouthAfrica	India	Botswana	Netherlands	Botswana	Turkey	Ethiopia	
Belgium	Uganda	India	Ghana	Netherlands	Cameroon	Turkey	SouthAfrica	
Bermuda	SouthAfrica	India	Mauritius	Netherlands	Ghana	UnitedKingdom	Botswana	
Bermuda	Uganda	India	SouthAfrica	Netherlands	Kenya	UnitedKingdom	Ghana	
Botswana	SouthAfrica	India	Uganda	Netherlands	SouthAfrica	UnitedKingdom	Kenya	
Brazil	Angola	Indonesia	Mauritius	Netherlands	Uganda	UnitedKingdom	Mauritius	
Brazil	SouthAfrica	Ireland	Mauritius	NewZeland	SouthAfrica	UnitedKingdom	Nigeria	
Bulgaria	SouthAfrica	Ireland	SouthAfrica	Nigeria	Ghana	UnitedKingdom	SouthAfrica	
Canada	Ghana	Israel	SouthAfrica	Nigeria	SouthAfrica	UnitedKingdom	Uganda	
Canada	Mauritius	Italy	Angola	Norway	Angola	UnitedStatesAmerica	Angola	
Canada	SouthAfrica	Italy	Congo	Norway	Ghana	UnitedStatesAmerica	Botswana	
Cayman	Mauritius	Italy	DemRepCongo	Norway	Kenya	UnitedStatesAmerica	Cameroon	
China	Angola	Italy	Eritrea	Norway	SouthAfrica	UnitedStatesAmerica	Congo	
China	Cameroon	Italy	Ethiopia	Pakistan	Mauritius	UnitedStatesAmerica	Eritrea	
China	Congo	Italy	Gabon	Pakistan	SouthAfrica	UnitedStatesAmerica	Ethiopia	
China	DemRepCongo	Italy	Ghana	Panama	SouthAfrica	UnitedStatesAmerica	Gabon	
China	Eritrea	Italy	Kenya	Paraguay	SouthAfrica	UnitedStatesAmerica	Ghana	
China	Ethiopia	Italy	SouthAfrica	Philippines	Mauritius	UnitedStatesAmerica	Kenya	
China	Gabon	Japan	SouthAfrica	Philippines	SouthAfrica	UnitedStatesAmerica	Mauritius	
China	Ghana	Kenya	Ghana	Poland	SouthAfrica	UnitedStatesAmerica	Nigeria	
China	Kenya	Kenya	Mauritius	Portugal	Angola	UnitedStatesAmerica	SouthAfrica	
China	Mauritius	Kenya	SouthAfrica	Portugal	Kenya	UnitedStatesAmerica	Uganda	
China	SouthAfrica	Kenya	Uganda	Portugal	SouthAfrica	Uganda	SouthAfrica	
Coted'Ivoire	Ghana	KoreaRep	Angola	Russia	SouthAfrica	UnitedArabEmirates	Ghana	
Cyprus	SouthAfrica	KoreaRep	Cameroon	SaudiArabia	Mauritius	UnitedArabEmirates	Mauritius	
CzechRep	Mauritius	KoreaRep	Congo	Seychelles	Mauritius	UnitedArabEmirates	SouthAfrica	
CzechRep	SouthAfrica	KoreaRep	DemRepCongo	Seychelles	SouthAfrica	Uruguay	SouthAfrica	
Denmark	Angola	KoreaRep	Ethiopia	Singapore	Ghana	Zambia	SouthAfrica	
Denmark	Cameroon	KoreaRep	Gabon	Singapore	Mauritius	Zimbabwe	Botswana	
Denmark	Congo	KoreaRep	Kenya	Singapore	SouthAfrica	Zimbabwe	Mauritius	
Denmark	Ghana	KoreaRep	SouthAfrica	Singapore	Uganda	Zimbabwe	SouthAfrica	
Denmark	Kenya	Lebanon	Ghana	Slovenia	Gabon			
Denmark	Mauritius	Liberia	Botswana	SouthAfrica	Angola			
Denmark	SouthAfrica	Liberia	SouthAfrica	SouthAfrica	Botswana			
Finland	DemRepCongo	Libya	SouthAfrica	SouthAfrica	Ghana			
Finland	Mauritius	Liechtenstein	SouthAfrica	SouthAfrica	Kenya			
Finland	SouthAfrica	Luxembourg	Botswana	SouthAfrica	Mauritius			
France	Angola	Luxembourg	Ghana	SouthAfrica	Namibia			
France	Cameroon	Luxembourg	Mauritius	SouthAfrica	Uganda			

Source: Sample data from UNCTAD FDI Statistics Division on Investment and Enterprise (http://unctadstat.unctad.org/wds/ReportFolders/reportFolders.aspx) accessed on 15th March 2015.

Table 2. Access to electricity rate, household electricity consumption and electricity net production in host countries, 2005 and 2011

	2005	2011
(Households) access to electricity (percent)		
Sub-Saharan Africa	53	67
Angola	15	38
Botswana	39	46
Cameroon	47	54
Congo, Dem. Rep.	6	9
Congo, Rep.	20	37
Eritrea	20	32
Ethiopia	15	23
Gabon	48	60
Ghana	49	72
Kenya	14	19
Mauritius	94	99
Namibia	34	60
Nigeria	46	48
South Africa	70	85
Uganda	9	15
Households electricity consumption (KW-hours, million)		
Sub-Saharan Africa	13,046	15,547
Angola	1,450	3,232
Botswana	539	873
Cameroon	518	1,052
Congo, Dem. Rep.	1,562	2,253
Congo, Rep.	179	323
Eritrea	98	120
Ethiopia	769	1,741
Gabon	622	804
Ghana	1,986	4,345
Kenya	1,206	1,424
Mauritius	608	725
Nigeria	10,302	13,568
South Africa	36,970	40,480
Uganda	341	397
Electricity net production (KW-hours, million)		
Sub-Saharan Africa	79,487	91,510
Angola	2,492	5,512
Botswana	833	371
Cameroon	4,004	5,354
Congo, Dem. Rep.	7,379	7,382
Congo, Rep.	352	1,148
Eritrea	272	321
Ethiopia	2,619	5,969
Gabon	1,527	1,990
Ghana	6,759	11,175
Kenya	6,721	7,526
Mauritius	2,224	2,686
Nigeria	22,866	26,260
South Africa	231,107	247,575
Uganda	1,873	2,578

Source: Sample data from International Energy Agency (http://www.worldenergyoutlook.org/resources/energydevelopment/energyaccessdatabase/) accessed on 24th February 2015 and United Nations Energy Statistics Database (http://data.un.org/Explorer.aspx?d=EDATA) accessed on 28th March 2015 and authors' calculation.

Table 3. Inward stock FDI per capita to SSA by home region, 2005 and 2011

Home regions	2005		2011		Cumulative from 2005 to 2011	
	FDI stock per capita ($ per capita)	percent	FDI stock per capita ($ per capita)	percent	FDI stock per capita ($ per capita)	percent
China (w/Hong Kong)	72.00	0.60	14,980.00	8.90	18,684.00	6.60
East Asia (w/o China and Hong Kong)	143.00	1.20	848.00	0.50	4,222.00	1.50
European Union	6,713.00	54.20	28,528.00	16.90	80,385.00	28.60
India	220.00	1.80	6,397.00	3.80	7,916.00	2.80
Latin America and Caribbean	57.00	0.50	18,368.00	10.90	20,713.00	7.40
North Africa and Middle East	696.00	5.60	635.00	0.40	6,541.00	2.30
North America	935.00	7.50	42,340.00	25.10	55,250.00	19.60
Oceania	42.00	0.30	9,685.00	5.70	12,014.00	4.30
Russia	37.00	0.30	8.00	0.00	153.00	0.10
South East Asia	100.00	0.80	36,635.00	21.70	42,543.00	15.10
South Asia (w/o India)	271.00	2.20	75.00	0.04	1,921.00	0.70
Sub-Saharan Africa	3,109.00	25.10	10,196.00	6.00	30,923.00	11.00
Total	*12,395*		*168,694*		*281,264*	

Source: Sample data from UNCTAD FDI Statistics Division on Investment and Enterprise (http://unctadstat.unctad.org/wds/ReportFolders/reportFolders.aspx) accessed on 15th March 2015 and authors' calculation.

Table 4. Institutional dimensions of the provision of electricity infrastructure

WORLDWIDE GOVERNANCE INDICATORS (WGIS)[A]	WGI DEFINITION[A]	INSTITUTIONAL DIMENSIONS[B]
Government Effectiveness	Quality of public and civil services and the degree of their independence from political pressures. Quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.	Government's ability in directly providing electricity; Credibility of regulatory system.
Political Stability and Absence of Violence and Terrorism	Likelihood of political instability and/or politically motivated violence, including terrorism.	Political stability.
Voice and Accountability	Extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media.	Administrative capabilities of the country; Judicial independence and professionalism.
Regulatory Quality	Ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.	Credibility of regulatory system.
Control of Corruption	Extent to which public power is exercised for private gain as well as "capture" of the state by elites and private interests.	Credibility of regulatory system; Judicial independence and professionalism.
Rule of Law	Extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.	Administrative capabilities of the country; Judicial independence and professionalism.

Sources: [A] Worldwide Governance Indicators from the World Bank (http://info.worldbank.org/governance/wgi/index.aspx#home) accessed on 13rd July 2015.
[B] Bergara et al., 1998.

Table 5. Host countries and home regions: Institutional quality, 2005 and 2011

	2005	2011
	Home countries	
Sub-Saharan Africa	*0.02*	*-0.02*
Angola	-1.79	-1.55
Botswana	1.21	1.04
Cameroon	-1.29	-1.32
Congo, Dem. Rep.	-2.39	-2.39
Congo, Rep.	-1.76	-1.51
Eritrea	-2.05	-1.61
Ethiopia	-1.53	-1.31
Gabon	-0.64	0.76
Ghana	-0.06	0.21
Kenya	-0.99	-0.97
Mauritius	1.09	1.25
Namibia	0.33	0.47
Nigeria	-1.58	-1.60
South Africa	0.68	0.44
Uganda	-0.93	-0.77
	Home regions	
All	*0.02*	*-0.10*
China (w/Hong Kong)	-0.78	-0.87
East Asia (w/o China and Hong Kong)	0.17	0.18
Europe	0.72	0.73
India	-0.99	-1.14
Latin America and Caribbean	-0.18	-0.28
North Africa and Middle East	-0.74	-1.04
North America	0.64	0.68
Oceania	1.00	1.11
Russia	-1.54	-1.57
South East Asia	0.11	-0.06
South Asia (w/o) India	-1.14	-1.36
Sub-Saharan Africa	-1.85	-1.11

Source: Sample data from Worldwide Governance Indicators from the World Bank (http://data.worldbank.org/data-catalog/worldwide-governance-indicators) accessed on 21st March 2015 and authors' calculations.

Table 6. Variables: Descriptive statistics and correlation matrix (N= 1,547)

		Mean	s.d.	Min	Max	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1)	Access to electricity	58.91	28.07	5.80	100	1												
(2)	FDI per capita	181.81	1496.38	0.04	39379.23	0.11***	1											
(3)	Inst. Quality host	0	1	-2.50	1.27	0.78***	0.10***	1										
(4)	Inst. Quality home	0	1	-2.58	1.38	-0.09***	0.05*	-0.11***	1									
(5)	Population	29.21	24.55	1.20	160.00	-0.12***	-0.12**	-0.19***	-0.03	1								
(6)	Rural pop.	50.70	16.47	13.85	86.75	-0.42***	-0.02	-0.26***	0.10***	0.02	1							
(7)	Pop. density	170.76	205.00	2.46	633.52	0.62***	0.17***	0.57***	0.01	-0.47***	0.17***	1						
(8)	Ind. value added	32.79	13.74	10.39	77.41	-0.16***	-0.01	-0.34***	0.02	-0.27***	-0.48***	-0.28***	1					
(9)	Serv. valued added	55.23	14.12	18.91	70.94	0.63***	0.07***	0.76***	-0.09***	0.12***	-0.02	0.40***	-0.59***	1				
(10)	LIC	0.28	0.45	0	1	-0.59***	-0.07***	-0.46***	0.09***	0.21***	0.65***	-0.16***	-0.42***	-0.29***	1			
(11)	LMIC	0.13	0.34	0	1	-0.22***	-0.01	-0.44***	0.07***	-0.22***	-0.11***	-0.19***	0.49***	-0.54***	-0.24***	1		
(12)	GDP cap host	4999.94	12302.27	35.59	249730	0.17***	0.03	0.17***	-0.03	-0.14***	-0.11***	0.11***	0.10***	0.08***	-0.16***	-0.04	1	
(13)	GDP cap home	25321.17	20984.69	185.96	117493.6	-0.08***	0.04*	-0.09***	0.81***	-0.03	0.09***	0.012	0.01	-0.08***	0.12***	0.04*	-0.06	1

Source: Authors' calculation.
*** Significant at 1 percent level.
** Significant at 5 percent level.
* Significant at 10 percent level.

Table 7. System-GMM estimates

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Access Electricity t-1	-0.6706***	-0.6881***	-0.6889***	-0.6937***	-0.7422***	-0.7423***
	(0.063)	(0.065)	(0.065)	(0.065)	(0.069)	(0.070)
Inst. Qual. host t-1		1.8468*	1.9306*	2.0648*	1.8367	1.7575
		(1.088)	(1.087)	(1.079)	(1.196)	(1.235)
FDI per capita t-1			0.0001	0.0049**	0.0046*	0.0049**
			(0.001)	(0.002)	(0.002)	(0.002)
FDI per capita t-1 x				-0.0056**	-0.0050**	-0.0046**
Inst. Qual. host t-1				(0.002)	(0.002)	(0.002)
Inst. Qual. home t-1					0.2147	0.2925
					(0.352)	(0.389)
FDI per Capita t-1 x						-0.0013
Inst. Qual. home t-1						(0.002)
Pop. t-1	0.1160***	0.1349***	0.1370***	0.1401***	0.1424***	0.1425***
	(0.032)	(0.034)	(0.034)	(0.034)	(0.034)	(0.034)
Rural pop. t-1	-0.4206***	-0.4066***	-0.4081***	-0.4033***	-0.4379***	-0.4420***
	(0.087)	(0.085)	(0.085)	(0.085)	(0.092)	(0.095)
Pop. density t-1	0.0514***	0.0510***	0.0512***	0.0520***	0.0532***	0.0534***
	(0.007)	(0.008)	(0.007)	(0.008)	(0.008)	(0.008)
Ind. value added t-1	-0.2895***	-0.2361**	-0.2329**	-0.2588**	-0.1403	-0.1384
	(0.090)	(0.099)	(0.097)	(0.101)	(0.119)	(0.117)
Serv. value added t-1	0.1168	0.0919	0.0892	0.0963	0.2855**	0.2898**
	(0.091)	(0.091)	(0.092)	(0.092)	(0.117)	(0.119)
LIC	-15.340***	-13.9427***	-13.8315***	-14.0651***	-12.0648***	-12.0008***
	(2.655)	(2.847)	(2.749)	(2.832)	(3.379)	(3.368)
LMIC	-2.4992	-1.3541	-1.3145	-1.3451	0.8223	0.8809
	(1.920)	(2.022)	(1.990)	(2.033)	(2.473)	(2.487)
Constant	59.7517***	58.9124***	54.0819***	58.9678***	48.2732***	48.1236***
	(9.466)	(9.565)	(9.537)	(9.670)	(10.370)	(10.262)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Country-pair FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,326	1,326	1,326	1,326	1,105	1,105
Nbr pair countries	221	221	221	221	221	221
AR(1)	-5.4293	-5.4132	-5.4101	-5.3690	-4.8606	-4.8680
AR(2)	1.1073	1.1117	1.1120	1.0605	0.3824	0.3863
Hansen test	217.0206	217.9898	220.8259	220.9698	220.8573	220.7759
Chi-Square	198	202	202	205	198	197
Wald Chi-Square	256.82	261.71	255.67	258.91	279.91	277.88

Source: Authors' calculation.

Notes: Dependent variable ΔAccess to electricity. Two-step system-GMM. Robust standard errors in parentheses.
All AR(1) test statistics statistically significant at the 1 percent level. All AR(2) test statistics statistically insignificant.
All Hansen test statistics statistically insignificant.

*** Significant at 1 percent level.

** Significant at 5 percent level.

* Significant at 10 percent level.

Table 8. Corrected LSDV estimates

VARIABLES	(1)
Access to electricity t-1	-0.9627***
	(0.069)
Institutional quality host t-1	3.2124
	(2.476)
FDIs per capita t-1	0.0047**
	(0.002)
FDIs per capita t-1 x Institutional quality host t-1	-0.0011*
	(0.001)
Institutional quality home t-1	6.5806***
	(0.909)
FDIs per capita t-1 x Institutional quality home t-1	-0.0052***
	(0.001)
Population t-1	-0.0102
	(0.014)
Rural population t-1	0.0849**
	(0.033)
Population density t-1	0.0018
	(0.006)
Industry value added t-1	-0.2085***
	(0.069)
Services value added t-1	0.1283
	(0.119)
LIC	-8.6780*
	(5.219)
LMIC	0.1197
	(2.082)
Year FE	Yes
Country-pair FE	Yes
Observations	1,326
Nrb of pair countries	221

Notes: Dependent variable ΔAccess to electricity. Corrected LSDV estimator. Standard error in parentheses.
Source: Authors' calculation.
*** Significant at 1 percent level.
** Significant at 5 percent level.
* Significant at 10 percent level.

Table 9. Access to electricity growth: Marginal effects of FDI per capita

	(1) System-GMM	(2) Corrected LSDV
H1	0.0164**	0.0075**
	(0.008)	(0.004)
H2	0.0052	0.0207***
	(0.009)	(0.004)

Notes: Model (1) Two-steps system-GMM. Robust standard errors in parentheses.
Model (2) Bias corrected LSDV. Standard errors in parentheses.
Source: Authors' calculation.
*** Significant at 1 percent level.
** Significant at 5 percent level.
* Significant at 10 percent level.

Table 10. Use of traditional biomass: system GMM and corrected LSDV estimates

VARIABLES	(1)	(2)
Use of traditional biomass t-1	-0.4404***	-0.8805***
	(0.171)	(0.045)
FDI per capita t-1	-0.0038	-0.0074***
	(0.007)	(0.002)
Institutional quality host t-1	-3.6856	-6.4583***
	(2.465)	(1.060)
FDI per capita t-1 x Institutional quality host t-1	0.0030	0.0051***
	(0.005)	(0.001)
Institutional quality home t-1	-0.2496	-0.6070
	(1.314)	(0.693)
FDI per capita t-1 x Institutional quality home t-1	-0.0010	0.0001***
	(0.004)	(0.000)
Population t-1	-0.0252	-0.0520***
	(0.051)	(0.007)
Rural population t-1	0.1568	-0.0529**
	(0.106)	(0.026)
Population density t-1	-0.0071	0.0234***
	(0.017)	(0.004)
Industry value added t-1	-0.0267	-0.0077
	(0.201)	(0.074)
Services value added t-1	-0.1823	0.1435
	(0.219)	(0.092)
LIC	10.5206***	-0.9576
	(3.405)	(3.797)
LMIC	3.3604	-2.4810**
	(2.844)	(1.171)
Constant	16.4292	
	(22.864)	
Year fixed effects	Yes	Yes
Country pair fixed effects	Yes	Yes
Observations	1,105	1,326
Number of pair countries	221	221
AR(1)	-4.0881	
AR(2)	-0.0740	
Hansen test	220.0635	
Chi Square	197	
Wald Chi Square	212.84	

Notes: Dependent variable ΔUse of traditional biomass.
Model (1) Two-steps system-GMM. Robust standard errors in parentheses.
All AR(1) test statistics statistically significant at 1percent level; all AR(2) test statistics statistically insignificant.
Hansen test statistic statistically insignificant.
Model (2) Bias corrected LSDV. Standard errors in parentheses.
Source: Authors' calculation.
*** Significant at 1 percent level.
** Significant at 5 percent level.
* Significant at 10 percent level.

Table 11. Use of traditional biomass: Marginal effects of FDI per capita

	(1) System-GMM	(2) Corrected LSDV
H1	-0.0113	-0.0166***
	(0.018)	(0.004)
H2	0.0039	-0.005*
	(0.015)	(0.003)

Notes: Model (1) Two-steps system-GMM. Robust standard errors in parentheses.
Model (2) Bias corrected LSDV. Standard errors in parentheses.
Source: Authors' calculation.
*** Significant at 1 percent level.
** Significant at 5 percent level.
* Significant at 10 percent level.

Table 12. Fund for Peace: system GMM and corrected LSDV estimates

VARIABLES	(1)	(2)
Access to electricity t-1	-0.7582***	-0.9341***
	(0.061)	(0.065)
Political strength host t-1	0.0241***	0.0264***
	(0.009)	(0.009)
FDI per capita t-1	0.6738***	-0.1371
	(0.124)	(0.234)
FDI per capita t-1 x Political strength host t-1	-0.0005*	-0.0006*
	(0.000)	(0.000)
Political strength home t-1	0.0251	0.0721***
	(0.034)	(0.002)
FDI per capita t-1 x Political strength home t-1	-0.0001	-0.0001***
	(0.000)	(0.000)
Population t-1	0.1324***	-0.0280**
	(0.035)	(0.013)
Rural population t-1	-0.3045***	0.1029***
	(0.100)	(0.037)
Population density t-1	0.0455***	0.0035
	(0.008)	(0.003)
Industry value added t-1	-0.0679	-0.2793***
	(0.097)	(0.053)
Services value added t-1	0.2194**	0.1736*
	(0.110)	(0.089)
LIC	-9.3903***	-9.6922**
	(2.646)	(4.736)
LMIC	4.0223*	-0.5907
	(2.207)	(1.268)
Constant	22.9551**	
	(11.501)	
Year fixed effects	Yes	Yes
Country-pair fixed effects	Yes	Yes
Observations	1,105	1,326
Number of paired countries	221	221
AR(1)	-5.0002	
AR(2)	0.2408	
Hansen test	220.7460	
Chi Square	197	
Wald Chi Square	290.29	

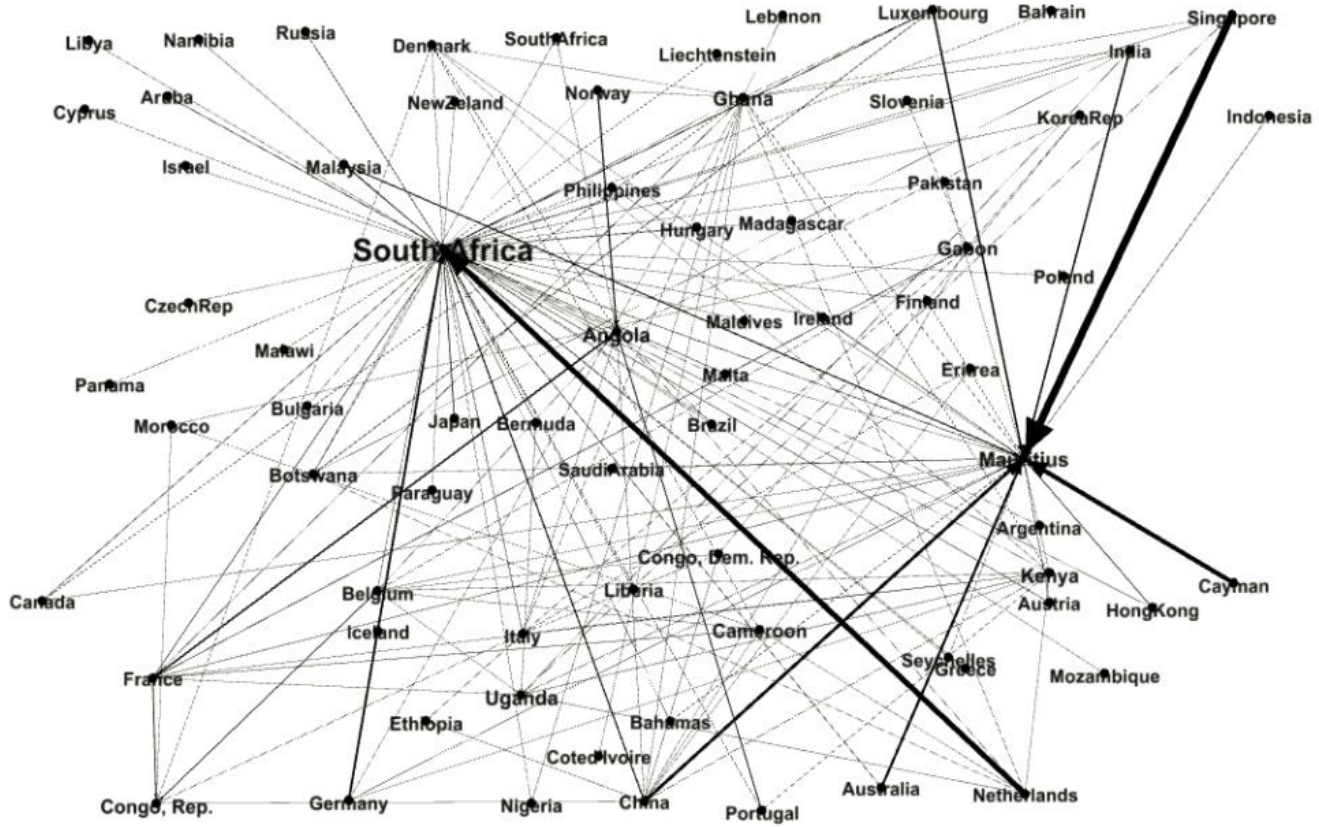
Notes: Dependent variable ΔAccess to electricity.
Model (1) Two-steps system-GMM. Robust standard errors in parentheses.
All AR(1) test statistics statistically significant at 1 percent level; all AR(2) test statistics statistically insignificant.
Hansen test statistic statistically insignificant.
Model (2) Bias corrected LSDV. Standard errors in parentheses.
Source: Authors' calculation.
*** Significant at 1 percent level.
** Significant at 5 percent level.
* Significant at 10 percent level.

Table 13. Fund for Peace: Marginal effects of FDI per capita

	(1) System-GMM	(2) Corrected LSDV
H1	0.0178**	0.0197**
	(0.008)	(0.009)
H2	0.0067	0.0071***
	(0.005)	(0.001)

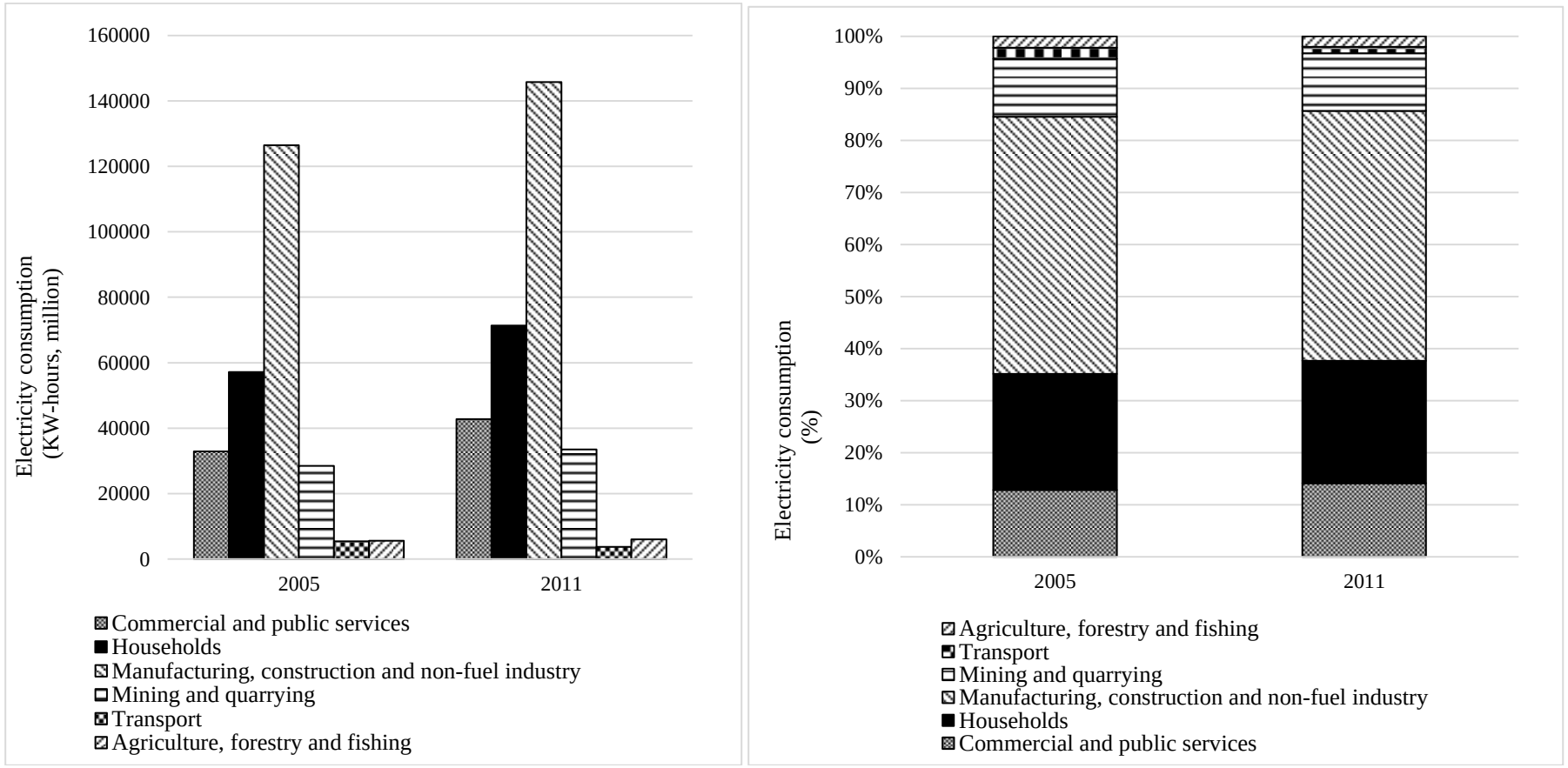
Notes: Model (1) Two-steps system-GMM. Robust standard errors in parentheses.
Model (2) Bias corrected LSDV. Standard errors in parentheses.
Source: Authors' calculation.
*** Significant at 1 percent level.
** Significant at 5 percent level.
* Significant at 10 percent level.

Graph 1. Network diagram of FDI stock per capita by home-host country pair



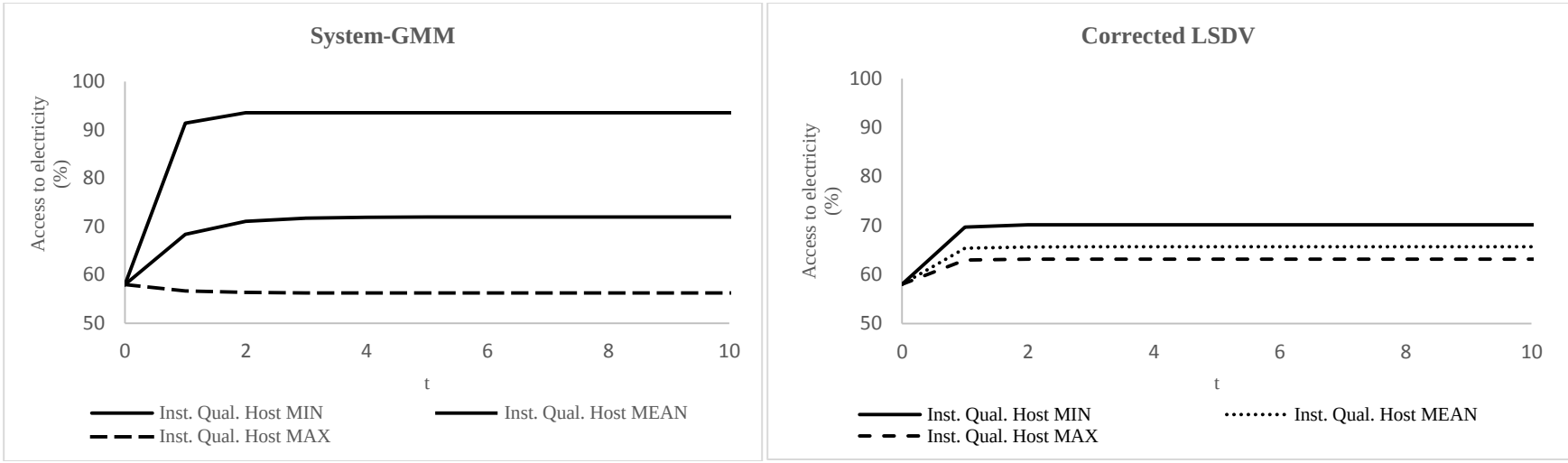
Source: Sample data from UNCTAD FDI Statistics Division on Investment and Enterprise (http://unctadstat.unctad.org/wds/ReportFolders/reportFolders.aspx) accessed on 15th March 2015 and authors' calculation.

Graph 2. Electricity consumption in sub-Saharan African host countries by sector, 2005 and 2011



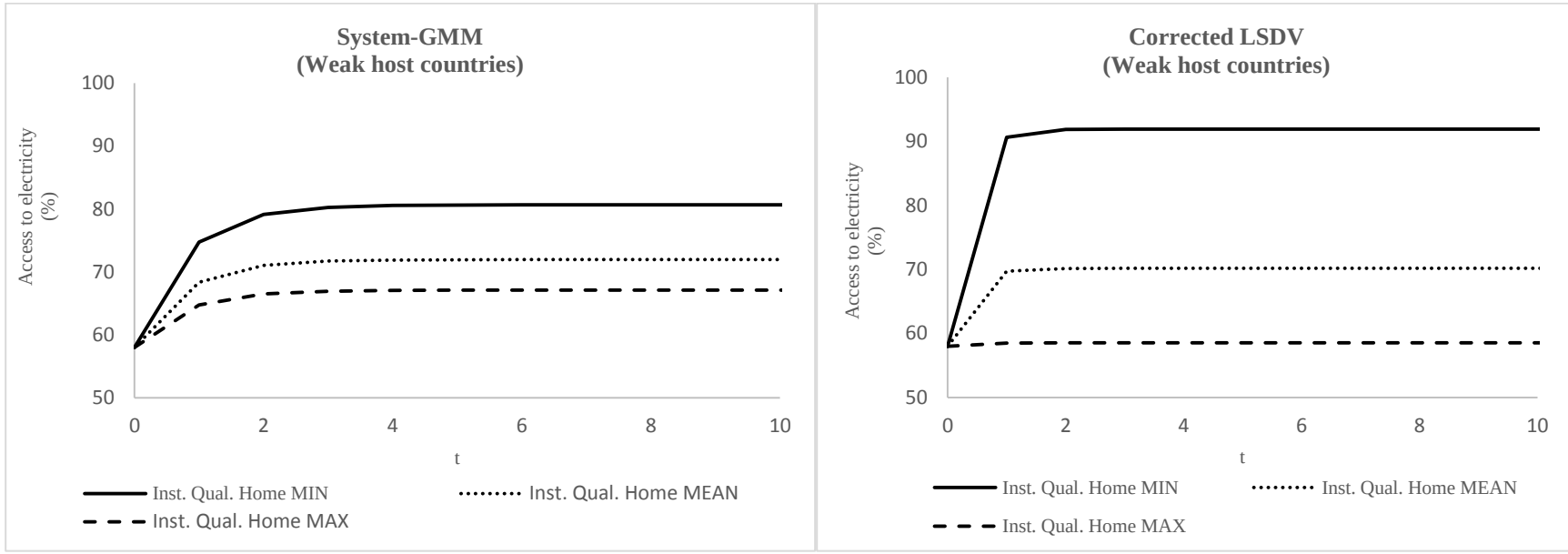
Source: Sample data from United Nations Energy Statistics Database (http://data.un.org/Explorer.aspx?d=EDATA) accessed on 24th March 2016.

Graph 3. Access to electricity response to a FDI shock over time, H1



Notes: All regressors, except for *FDI per capita* (variable) and *institutional quality host* (maximum, mean and minimum value) are set at the sample mean.
Sources: Authors' calculations.

Graph 4. Access to electricity response to a FDI shock over time, H2



Notes: All regressors, except for *FDI per capita* (variable), *institutional quality host* (minimum value) and *institutional quality home* (maximum, mean and minimum value) are set at the sample mean.
Sources: Authors' calculations.

APPENDIX

Table A.1. Characteristics of electricity provision in sub-Saharan Africa

Provision System *	Technology *	Target Population *	Infrastructure Features			MNE Engagement Channels
			Widespread domestic consumption	Economies of scale and scope	Sunk investment	
On-grid systems *(large international, national and regional grids)*	Large Solar Photovoltaics Farms Gas - Gas Turbines Plants Gas - Combined Cycles Gas Turbine Plants Onshore Wind Farms Large Hydropower Plants Coal Plants	Urban, Peri-Urban, Growing demand areas	Yes	Yes	Yes	Infrastructure planning, financing, constructing (greenfield or repowering), operating or maintaining
Distributed small-scale systems						
Mini - grid systems	Small Solar Photovoltaics Plants Small Hydropower Plants Small Wind Plants	Rural	Yes	Yes/No	Yes	Infrastructure planning, financing, constructing (greenfield or repowering), operating or maintaining
Off - grid systems	Stand-Alone Generators (fueled by diesel or gasoline)	Rural	No	No	Yes/No	No engagement

Sources: * IEA, 2014. # Levy and Spiller, 1994. § Ostrom et al., 1993.

Table A.2. Access to electricity rate, household electricity consumption and electricity net production (host countries): Correlation matrix from 2005 to 2011

		(1)	(2)	(3)
(1)	(Households) Access to electricity	1		
(2)	Households Electricity consumption	0.4542***	1	
(3)	Electricity net production	0.4526***	0.9989***	1

Source: Sample data from International Energy Agency (http://www.worldenergyoutlook.org/resources/energydevelopment/energyaccessdatabase/) and United Nations Energy Statistics Database (http://data.un.org/Explorer.aspx?d=EDATA) accessed on 24th March 2015 and authors' calculations.

Table A.3. Factor analysis

World Bank Governance Indicators (WGIs)	Institutional Quality Host		Institutional Quality Home	
	Loadings	Uniqueness	Loadings	Uniqueness
Political stability	0.8230	0.3226	0.9449	0.1071
Rule of law	0.9615	0.0756	0.9554	0.0873
Voice and accountability	0.9467	0.1037	0.9502	0.0971
Control of corruption	0.9338	0.1280	0.8468	0.2829
Governance effectiveness	0.9644	0.0700	0.9628	0.0730
Regulatory quality	0.9357	0.1245	0.8520	0.2741
Cumulative proportion of WGIs variance explained by the factor	**86.26%**		**84.64%**	

Source: Author's calculations.

Table A.4. Overview of robustness checks

	H1		H2	
	System-GMM	Corrected LSDV	System-GMM	Corrected LSDV
Main Model	Confirmed	Confirmed	-	Confirmed
Robustness checks				
Use of traditional biomass (instead of access to electricity)	-	Confirmed	-	Confirmed
Fund for peace (instead of WGIs)	Confirmed	Confirmed	-	Confirmed
Natural resources (instead of industry and services value added)	Confirmed	Confirmed	-	Confirmed
GDP per capita (instead of LIC and LMIC)	Confirmed	-	-	Confirmed
Sample without FDI per capita stocks from EU	Confirmed	-	-	Confirmed
Sample FDI per capita stocks from China	Confirmed	-	-	Confirmed
Sample without multiple imputation	Confirmed	-	-	-
Reverse causality	Rejected			

Note: "-" Not significant.

Source: Authors' calculations.

A2. PAPER 2

Multinational enterprises and the provision of collective goods in developing countries under informal institutional voids

The case of electricity in sub-Saharan Africa

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Keywords: FDI, developing country, electricity, informal institutions, sub-Saharan Africa

Abstract

Despite their unprecedented growth, developing countries still face severe problems in the provision of collective goods. An emblematic case is electricity, which provision is scarce and/or unreliable in most of developing regions, especially sub-Saharan Africa. The reason of this shortage is imputable not only to the lack of strong national governments, but also to the inefficacy of informal institutions in implementing alternative solutions for the production, transmission and distribution of electricity. In this context of institutional voids, multinational enterprises can play a decisive role. However, their effectiveness strongly depends also on the informal institutional proximity between the country of origin and destination of the multinational. Our econometric analysis, performed on sub-Saharan Africa, confirms these expectations.

1. Introduction

The impact of multinational enterprises (MNEs) on host countries, especially developing countries, has been widely debated generating substantial controversy (for a recent overview, see e.g., Oetzel and Doh, 2009). On the one hand, MNEs promote economic growth by rising domestic savings, transferring technology and knowledge, increasing domestic competition and stimulating entrepreneurship (Caves, 1974; Teece, 1977); on the other hand, MNEs crowd out local firms, introduce inappropriate technologies, constrain potential technology and knowledge spillover, and reduce domestic tax revenues because of the transfer price and profit manipulation (Haddad and Harrison, 1993; De Backer and Sleuwagen, 2003). This controversy about the impact of MNEs is not limited to economic performance, but covers also non-economic dimensions, such as environment or human rights (Hubler

and Keller, 2010; Giuliani and Macchi, 2013)[39]. With the current work, we want to join this debate by investigating the role that MNEs might play in promoting a specific dimension of development, that is the access to electricity for local population, following previous studies on the impact of MNEs' presence on the energy development of developing countries (e.g., Sesan *et al*., 2013; D'Amelio *et al*., 2016).

The focus on this specific dimension of development, is due to the fact that electricity is a collective good[40], essential for communication systems, industrial development and the functioning of public services, such as improved education and health care (Ahlborg *et al*., 2015). However, according with the estimates by the International Energy Agency (IEA), 1.3 billion people in developing countries, equivalent to 17 per cent of the global population, had not access to electricity in 2013. Nearly 97 per cent of those live in sub-Saharan Africa (SSA) and developing Asia (IEA, 2014). This severe shortage of electricity access is mainly due to the decline in infrastructure investments and maintenance for the production, transmission and distribution of electricity, in the last half of twentieth century (Robbins and Perkins, 2012)[41].

In this paper, we analyse the problem of the shortage of access to electricity with the lens of the institutional theory. In so doing, we refer to formal and informal institutions (North, 1990). Formal institutions are rules observable through written documents or rules that are determined and executed through formal positions, such as authority or ownership. They include juridical rules, explicit

[39] Some works show that in developing countries, MNEs increases child labour exploitation, environmental degradation and, the adoption of inadequate safety standards (Clapp and Dauverge, 1993). These works demonstrate that developing countries are pushed to reduce their standards to attract a higher proportion of MNEs, participating in a global race to the bottom. However, a group of scholars, who finds a positive effect of MNEs on the environment, human and labour rights, has criticised this perspective (Wheeler, 2001; Oetzel and Doh, 2009). They argue that MNEs bring cleaner and more efficient technologies in developing countries and improve their living conditions through the adoption of voluntary codes of ethical conduct and corporate social responsibility policies (Hubler and Keller, 2010; Giuliani and Macchi, 2013).

[40] Collective goods are commodities, functions and services that provide positive externalities to local collectivities and whose supply is assured by governments and/or private organizations. These goods are either non-excludable but rival or non-rival but excludable; public-economists call them "impure" public goods (Boddewyn and Doh, 2011).

[41] Reasons of this decline are complex and vary across countries. Therefore, some common features can be identified. Namely, the decline of state revenues coming from the commodity price crisis of the 1970s, the political and economic instability and the raising debts. These factors have been reinforced by the little attention of the Millennium Development Goals to the importance of electricity infrastructure in meeting development targets (Robbins and Perkins, 2012).

incentives, contractual terms, and economic rules/property rights (North, 1990). Informal institutions are non-codified systems of shared values and collective understanding, which shape cohesion and coordination among individuals in a society (Holmes *et al.,* 2013).

Electricity shortage could be due either to the weakness of formal institutions (namely, governments) in providing and/or regulating the provision of electricity infrastructure (Levy and Spiller, 1994; Henisz, 2002; Gillanders, 2014), or to the inability of informal institutions in self organising collective actions (i.e., electricity cooperatives and/or non-profit organisations (NGOs)) for the introduction of decentralised systems for the generation, transmission and distribution of electricity (Ostrom *et al*., 1993; Hansmann, 1996; Teegen, 2003). When both institutions are unable to develop lasting solutions for the provision of electricity to local population, we argue that the country is under formal and informal institutional voids. In this context, MNEs may actively participate to the development and maintenance of electricity infrastructure, alone or in partnership with profit organizations and/or NGOs (Boddewyn and Doh, 2011). In fact, developed and reliable electricity infrastructure is important for MNEs to gain access to essential production inputs, to reduce costs, to increase business opportunities and to secure business activities (North, 1990). Further, if local population benefit from the electricity infrastructure developed by MNEs, this can help MNEs to gain legitimacy with local stakeholders, thus raising the formers' likelihood of success (Holburn and Zelner, 2010). However, when analysing the ability of MNEs of transforming disadvantages in advantages, it is also important to consider the institutional environment of the country of origin of the multinational. Indeed, firm managers' competences depend on their specific formal and informal institutional setting (Kostova and Zaheer, 1999). Thus, according with Cuervo-Cazurra and Genc (2008), we expect that the MNEs more effective in developing electricity infrastructure and raise access to electricity would be those from countries with formal or informal institutions that are similar to the host country's.

In this paper we focus on SSA as this is one of the regions in the world that experienced the biggest increase, in percentage, of MNEs' presence in the last decade, i.e., 120 per cent increase of inflow foreign direct investments (FDIs) from 2005 to 2014 (Source: UNCTAD). In fact, a stable economic growth, a burgeoning middle class, an increasing purchasing power and a youthful population has led Ernest and Young to rank SSA as the second most attractive region in the world in 2014 (E&Y, 2014). Nevertheless, the region, has still the lowest access to electricity rate in the world, i.e., 68 per cent of

the population has no access to electricity, equals to 634 millions of people (IEA, 2014). In this context, MNEs can really have a role in stimulating the long term development of the region.

In order to test how the impact of MNEs on the access to electricity is moderated by the quality of institutions, we relied on a growth model (Solow, 1957). Our dataset comes from the merging of four different databases. The access to electricity rate is sourced from the World Energy Outlook of the IEA. The formal institutional quality is measured by means of the six Worldwide Governance Indicators of the World Bank. The quality of informal institutions is proxied by the degree of institutional collectivism (Source: GLOBE project) and interpersonal trust (Source: World Value Survey). Finally, the MNEs' presence is measured by bilateral FDI directed to SSA, which give us information about the country of origin and destination of the investment (Source: UNCTAD). The investigated period covers seven years, from 2005 to 2011. Results, obtained by means of panel data techniques, confirm that FDI and MNEs can raise the access to electricity of local population, and that FDI's effectiveness strongly depends on both formal and informal institutions of the country of origin and destination of the investment. Specifically, in countries where not only formal but also informal institutions are weak, MNEs can be a viable tool to raise the access to electricity of local population. This is more likely to be true if the MNE come from countries also weak in the informal institutional settings, i.e., individualist and distrusted societies.

This paper moves a step forward to the literature on the impact of MNEs on developing countries, by focusing on an important prerequisite for development – the provision of electricity – and on a moderating factor that is often under investigated - informal institutions-. Further, this paper want to show that the full institutional setting has to be taken into consideration to understand under which conditions MNEs can be engine for development. Thus, these results have important implications for policy makers of developing countries as they help to understand which type of MNEs have to be attracted in order to mitigate the problem of shortage of electricity, based on the institutional characteristics of both home and host country. In addition, they reinforce the idea that policy makers have to take into consideration not only the formal institutions but also the informal ones, when they define policies to attract and manage MNEs.

This article is organized as follows. In section 2, we present our theoretical framework. Section 3 discusses data and variables employed in our analysis. Section 4 describes the model. Sections 5 and 6 present results and robustness checks, respectively. Finally, section 7 concludes.

2. Theoretical Framework

2.a) Formal and informal institutions and electricity provision

Formal institutions have historically been involved in the development or regulation of electricity infrastructure. Infrastructure assets, are highly specific and not redeployable, they enjoy important economies of scale and scope, and have a broad range of domestic users (Levy and Spiller, 1994). The combination of these features generate problems of transaction costs and make infrastructure highly vulnerable to expropriation risks and strongly dependent on the quality of formal institutions (Henisz, 2002). In developing countries, the functioning of formal institutions can sort to vary degrees when judicial system is inefficient, regulation is misguided, and information is not reliable, generating what Khanna and Palepu (1997) call *formal institutional voids*. These formal institutional voids can make national governments ineffective in developing or regulating electricity infrastructure.

Under this condition, D'Amelio et al (2016) demonstrate that MNEs actively participate to the development of infrastructure for the provision of electricity to local population. Indeed, MNEs need reliable electricity for running their business activities (North, 1990); furthermore, by providing electricity to the local population, these firms internalise societal failure and are more likely to show commitment towards the country where they are investing, thus gaining legitimacy with local stakeholders, e.g., civil society, politicians and local representatives (Buckley and Boddewyn, 2014). In fact, legitimatization with local stakeholders is fundamental to increase foreign firms' chances of survival and success in the host market (DiMaggio and Powell, 1983). Furthermore, the authors show that the effectiveness of MNEs in compensating the inability of host country institutions in providing electricity strongly depends also on the formal institutional environment of the country of origin. A possible explanation could be that managers from these countries already developed at home the capability to deal with weak formal institutions and are more effective in identifying key host country actors and form winning coalitions (Cuervo-Cazurra and Genc, 2008; Holburn and Zelner, 2010).

However, in a context of formal institutional voids, informal institutions can emerge as important entities for the provision of collective goods (Teegen, 2003). Namely, Informal institutions can complement, and often supplant, formal institutions, in the provision of electricity through NGOs (Teegen, 2003) and/or self-organized systems, owned and/or managed by a group of consumers or by local communities, e.g., electricity cooperatives (Ostrom et al., 1993; Hansmann, 1996). However, while formal institutions -governments- provide electricity mainly through the development of large

national or regional grids, informal institutions - electricity cooperatives and NGOs - provide electricity through the management, operation and maintenance of local mini-grid and off-grid systems[42] (IEA, 2014). This is trues especially in SSA, more than in other developing regions, such as developing Asia, where informal institutions sometimes are also involved in the extension of national grids[43].

2.b) Informal institutions understood as social capital

Informal institutions may be also associated to the social capital of developing countries, understood as the "goodwill available to individuals or groups, which source lies in the structure and content of the actor's social relations" (Adler and Kwon, 2002: 23). A higher social capital corresponds to stronger linkages among individuals or groups, thus lowering transaction costs, favoring cohesiveness, and facilitating the pursuit of collective goals (Sandefyr and Laumann, 1998).

Specifically, the level of social capital and, consequently, of the quality of informal institutions lies on the social structure where each actor is located, namely on the level of trust and collectivism among individuals or groups that compose the society (Leana and Van Buren, 1999).

On one side, , trust is a "generalized expectancy held by an individual that the word, promise, oral or written statement of another individual or group can be relied upon" (Rotter, 1980:1). In economic terms, trust is a mechanism that mitigates against the risk of opportunistic behaviour among those engaged in various type of economic transactions (Bigley and Pearce, 1998). For this reason, trust represents itself as a key motivational source of social capital (Adler and Kwon, 2002). On the other side, collectivism, defined as the willingness and ability of individuals to define collective goals that are enacted collectively, is essential for the social capital generation (Leana and Van Buren 1999).

This implies that in order to be successful and long-term sustainable in the provision of electricity, informal institutions have to operate in collectivist and trust-based societies, where community members trust each other and act based on group rationality rather than individual rationality (Ostrom,

[42] Mini-grids link households and other consumers, but are not connected to larger regional grids; off-grids are stand-alone systems for individual households or consumers (IEA, 2014).

[43] Examples of electricity cooperatives involved in the development of off-grid and mini-grid systems can be found in Tanzania, e.g. the Urambo Electric Consumers Cooperative Society, or in Uganda with the Bundibugyo Electric Cooperative Society. As far as we know, only one case seems to exist so far in which cooperatives have been employed to manage grid extension, i.e., the case of Burkina Faso (Source: https://energypedia.info/wiki/Electrifying_Africa:_Grid_Extension_Models_in_Sub-Saharan_Africa accessed on the 15th November 2016).

2000). On the contrary, individualist and distrusted societies generally have bigger difficulties in coordinating self-organized and collective actions, undermining the long-term development of the community and generating a sort of *informal institutional void* (Ostrom et al., 1993; Holmes et al., 2013).

2.c) The role of MNEs in the electricity provision

In a context of institutional voids where neither formal nor informal institutions guarantee the provision of electricity, MNEs could emerge as important actors (Oetzel and Doh, 2009). They can fill the institutional voids and contribute to the electrification of the developing countries affected by political instability, poor administrative capabilities, lack of judicial independence and credibility of regulatory system and, individualist and distrusted societies. The reason of MNEs' involvement is that they need to develop strategies that allow them a competitive advantage to reduce the costs stemming from the unfamiliarity with the local environment (Zaheer, 1995). The participation to the electrification of the host country can be one of these strategies and can help MNEs to overcome the lack of legitimation with local stakeholders for being a private and profit-driven entity (D'Amelio *et al.*, 2016).

Our first hypothesis than states as follows.

H1. *In developing countries, MNEs raise the access to electricity when both formal and informal host country institutions are weak.*

Table 1 shows the solutions that can be adopted for the provision of electricity in developing countries for different quality of formal and informal institutions.

[Insert Table 1 here]

The effectiveness of MNEs in compensating the inability of host country institutions in providing electricity strongly depends also on the institutional environment of the country of origin (Kostova and Zaheer, 1999; Cuervo-Cazurra and Genc, 2008; D'Amelio *et al.,* 2016). However, so far the literature focuses only on the formal institutional setting, while in this paper we argue that this is true also when informal institutions are considered. Indeed, managers from individualist and distrusted countries are already familiar with the inability of local communities and NGOs in compensating the weakness of national government and implementing sound and lasting actions for the provision of electricity to local population. For this reason, compared with MNEs from countries with strong informal institutions, MNEs from informal institutionally weak countries are more likely to have already

developed in-house alternative solutions for the provision of electricity to the population of the countries where they operate. Accordingly, our second hypothesis states as follows.

H2. In developing countries affected by formal and informal institutional voids, MNEs are more effective in raising access to electricity if they come from a country similar not only in the formal but also in the informal institutional environment.

3. Data and descriptive statistics

3.a) Sample

Our sample is composed of pairs of home-host countries, the latter all from SSA, observed from 2005 to 2011. Missing data are an issue, especially for the variables that measure the access to electricity for local population and inward FDI. However, the problem is solved by adopting multiple imputation techniques (Allison, 2001)[44], leading to a final sample of 1,547 observations. Table 2 shows the list of host and home countries contained in our sample.

[Insert Table 2 here]

3.b) Dependent Variable

Access to Electricity Growth. The dependent variable is the annual growth of the percentage of households with access to electricity (Source: IEA). According to the definition provided by the IEA, access to electricity comprises consumption of a minimum level of electricity, sets equal to 250 kilowatt-hours (kWh) per year for rural households and to 500 kWh per year for urban households (IEA, 2014). This variable includes infrastructure and non-infrastructure solutions for the provision of electricity (e.g., diesel generators) and mainly refers to the supply side of electricity access. In order to overcome these limitations we include control variables that capture determinants of the electricity demand (e.g., country economic structure or income level) and obstacles to the development of electricity infrastructure (e.g., percentage of rural population and population density).

Table 3 shows data on the access to electricity from 2005 to 2011 in the host countries of our sample. Overall, the access to electricity increased in all sub-Saharan countries, with peaks in Namibia (+26%),

[44] With multiple imputation, missing values are drawn from a distribution of observed variables, including the variables at stake. Multiple imputation does not entail interpolation from contiguous values. Instead, it is generated by chained equations, an option that is suitable for dealing with a high proportion of missing data (Allison, 2001). Finally, in order to guarantee the consistency of imputed data, we removed all the paired countries with less than three observations per variable, over the seven years.

Angola and Ghana (both +23%). Countries with the highest rate of access to electricity in 2011 are Mauritius (99%) and South Africa (85%); the most problematic countries are Congo Democratic Republic (9%), Uganda (15%) and Kenya (19%).

[Insert Table 3 here]

3.c) Independent Variables

FDI per capita. Bilateral inward FDI stocks disaggregated by home and host country are adopted for measuring MNEs' presence (Source: UNCTAD). Since inward FDI stock is an extensive variable, which varies with the country's size, and our dependent variable is expressed as a percentage of population, bilateral FDI per capita are employed[45].

Table 4 shows the distribution of FDI per capita by region of origin and country of destination. European Union appears to be the major investor (28% of total FDI per capita), followed by North America (19%), South East Asia (15%) and SSA (11%). Chinese FDI rank sixth, with a total amount of $19k per capita (7% of total FDI per capita)[46].

Looking at the countries of destination of FDI, what emerges from our sample is that, from 2005 to 2011, the country that received the highest amount of FDI per capita were the Mauritius (72%), followed by South Africa (8%) and Namibia (7%).

[Insert Table 4 here]

Formal Institutional Void. Formal institutional void in the host countries is measured through the six World Bank's Worldwide Governance Indicators (WGIs) on a yearly basis. The WGIs are regulatory quality, control of corruption, voice and accountability, rule of law, governance effectiveness and political stability and, absence of violence and terrorism. We choose these indicators as they are a good proxy of the four institutional mechanisms that, based on Bergara *et al*. (1998), are necessary to guarantee the feasibility of infrastructure investment (for details see Appendix A.1). However, there is not a univocal correspondence between the WGIs and these four mechanisms. For this reason, all the

[45] As per access to electricity, also this variable is affected by missing data (26%), which have been treated with multiple imputation techniques (Allison, 2001).

[46] A possible explanation of the small amount of Chinese FDI could be that Chinese companies rely heavily on government sponsored assistant projects, which make ambiguous the distinction between FDI and official assistance. For instance, investments by Chinese state owned enterprises (SOEs) can be included in the definition of official flows of development assistance if they receive subsidized state financing the export credits (WB, 2015).

six WGIs have been considered. In addition, due the high correlation among these indicators (coefficient > 0.7 and p<0.01) and in line with the previous literature (e.g., Farla *et al.,* 2014), a factorial analysis is performed, which leads to the creation of an unique indicator of the degree of host country formal institutional void, as shown in Table 5. This variable has a high value when the host country is affected by severe formal institutional void and low value for higher quality of formal institutions.

[Insert Table 5 here]

Informal Institutional Void. As explained in section 2 informal institutions fail in the provision of electricity when there is a high degree of individualism and distrust. For this reason, two variables are used to measure the degree of void of informal institutions in the host country: institutional collectivism, sourced from the Global Leadership and Organisational Behaviour Effectiveness (GLOBE) project and, the degree of interpersonal trust, sourced from the World Value Survey (WVS).

The institutional collectivism reflects "the degree to which organisational and societal institutional practices encourage and reward collective distribution of resources and collective action" (House *et al*., 2004: 30). High institutional collectivism corresponds to low level of informal institutional voids, while low collectivism reveals high informal institutional voids.

The second dimension of informal institutions is the degree of interpersonal trust in a society, as it explains why actors in some settings tend to cooperate while do not to cooperate in other settings (Ostrom *et al.,* 1993; Cox *et al.*, 2009). High level of interpersonal trust corresponds to low level of informal institutional voids, while low trust reveals high informal institutional voids.

In addition, as informal institutions change slowly, both variables are time invariant, on the contrary of the formal institutional void.

Formal and Informal Institutional Proximity. Using the same procedures and sources presented above, we measure the degree of formal and informal institutional voids also for the home countries. Afterwards, we measure the dyadic distance between the level of institutional void in the home and host country by means of the Mahalanobis method, which is a better choice than the more traditional Euclidean method, as it is scale invariant and takes into consideration the variance–covariance matrix (Berry *et al*., 2010). Finally, we inverted the measures of institutional distance, obtaining the level of institutional proximity between home and host country, for both formal and informal institutions.

3.d) Control Variables

The statistical analysis includes a number of control variables.

First, the growth of the access to electricity rate is largely dependent on economic resources (Ahlborg *et al.*, 2015). Thus, we introduce two dummies, low-income country (LIC) and lower middle-income country (LMIC), to control for the host country income level. The dummy upper middle-income country (UMIC) represents our baseline. The classification comes from the World Bank and is built, on a yearly basis, using the nominal gross national income (GNI) per capita indicator[47].

In addition, to control for the host country's economic structure and mitigate the lack of information about the sector of the inward FDI, the industry and services value added variables are included, both expressed as a percentage of the gross domestic product (GDP) (Source: World Bank's Development Indicators). Specifically, industry value added covers mining, manufacturing, construction, electricity, water, and gas; while services value added comprises wholesale and retail trade (including hotels and restaurants), transport, government, financial, professional, and personal services, such as education, health care, and real estate services. The two variables take a low value if the country is specialised in agriculture, husbandry, forestry and fishing.

Since, *ceteris paribus*, it is more difficult to increase access to electricity when the population lives in rural areas and is spread; we include rural population and population density as controls. The former is measured by the annual percentage of population living in rural areas; the latter is measured by the number of people per square kilometre of land area. Both variables are sourced from the World Bank's Development Indicators.

Further, as electrification shows scale effects, we control for the size of the country, expressed in millions of people (Source: World Bank's Development Indicators).

Finally, time and country pair dummies are added in order to capture time varying macroeconomic shocks and unobservable country pair specific factors.

3.e) Descriptive Statistics

Table 6 shows the descriptive statistics and correlation matrix of our model variables. The overall pattern does not reveal multi collinearity.

[Insert Table 5 here]

[47] See http://data.worldbank.org/about/country-and-lending-groups accessed on 15 June 2016.

In the host countries of our sample the mean of the access to electricity is 59 per cent and varies from 6 to 99 per cent. FDI per capita has a big variance (standard error equals to 1496), reinforcing what already emerged in table 3: FDI are not uniformely spread through all the host countries of our sample. Formal institutional void varies from 0 to 4, with a small standard deviation, equals to 1. On the contrary, informal institutional void measured by the degree of collectivism varies from 0 to 1, while informal institutional void measured by the degree of distrust varies from 0 to 2529. It is interesting to notice that, rich and urbanized countries are more individualist but have a higher degree of interpersonal trust. In addition, in order to have a high degree of institutional collectivism, formal institutions have to be strong, but this leads to lower level of interpersonal trust. Finally, what emerges is that LIC, characterised by low domestic saving rates and tax revenues, are particularly sensitive to urbanisation rate.

4. Methodology

We adopt a growth model (Solow, 1957), operationalized as shown in Equation (1), which represents our baseline.

(1) $$\begin{aligned}\Delta Access\ to\ Electricity_{\ i,t} = {} & \alpha_0 + \alpha_1\ Access\ to\ Electricity_{\ i,t-1} \\ & + \beta_1\ FDI\ per\ capita_{\ i,j,t-1} + \\ & + \beta_2\ Formal\ Institutional\ Void_{\ i,t-1} + \beta_3\ Informal\ Institutional\ Void_{\ i} + \\ & + \beta_4\ FDIs\ per\ capita_{\ i,j,t-1} * Formal\ Institutional\ Void_{\ i,t-1} \\ & + \beta_5\ FDIs\ per\ capita_{\ i,j,t-1} * Informal\ Institutional\ Void_{\ i} \\ & + \gamma\ Z'_{\ i,t-1} + \delta\ D'_{i,t} + \varphi_t + \chi_{ji} + \varepsilon_{ij,t}\end{aligned}$$

Where i is the host country, j is the home country, t is the year, ϕ_t and χ_{ji} are the unobservable year and country pair fixed effects, respectively; $\varepsilon_{ij,t}$ is the i.i.d. disturbance term.

Access to electricity$_{i,t\cdot1}$ is the lagged dependent variable in level, which allows to control for the dynamics of the process. $Z'_{i,t-1}$ is the vector of controls lagged by of one period (population, rural population, population density, and industry and services value added), while $D'_{i,t}$ is the vector of LIC and LMIC dummies. The independent variables (FDI per capital and the two institutional dimensions) are inserted in level and interacted each other. However, to test the moderating role of host formal and informal institutional voids, the calculation of marginal effects is required, as shown by Equation (2).

(2) $$\left|\frac{\partial(\Delta\text{Access to electricity}_{i,t})}{\partial(\text{FDI per capita}_{i,j,t-1})}\right| = \beta_1 + \beta_4(Formal\ Institutional\ Voids_{\ i,t-1})_{max} + \beta_5(Informal\ Institutional\ Void_{\ i})_{max}$$

Finally, Equation (1) is extended by introducing one by one respectively the formal and informal institutional proximity, linearly and interacted with FDI per capita, as shown in Equation (3).

(3) $$\Delta Access\ to\ Electricity_{\ i,t} = \alpha_0 + \alpha_1\ Access\ to\ Electricity_{\ i,t-1} + \beta_1\ FDI\ per\ capita_{\ i,j,t-1} + + \beta_2\ Formal\ Institutional\ Void_{\ i,t-1} + \beta_3\ Informal\ Institutional\ Void_{\ i} + + \beta_4\ FDIs\ per\ capita_{\ i,j,t-1} * Formal\ Institutional\ Void_{\ i,t-1} + \beta_5\ FDIs\ per\ capita_{\ i,j,t-1} * Informal\ Institutional\ Void_{\ i} + \beta_6\ Institutional\ Proximity_{\ i,j,t-1} + + \beta_7\ FDIs\ per\ capita_{\ i,j,t-1} * Institutional\ Proximity_{\ i,j,t-1} + \gamma\ Z'_{\ i,t-1} + \delta\ D'_{i,t} + \varphi_t + \chi_{ji} + \varepsilon_{ij,t}$$

Even in this case, marginal effects have to be calculated, as operationalized in Equation (4).

(4) $$\left|\frac{\partial(\Delta\text{Access to electricity}_{\text{i.t}})}{\partial(\text{FDI per capita}_{\text{i,j,t-1}})}\right| =$$

$$\beta_1 + \beta_4(Formal\ Institutional\ Voids_{\ i,t-1})_{max} + \beta_5(Informal\ Institutional\ Void_{\ i})_{max} + \beta_6(Institutional\ Proximity_{\ i,t-1})_{max}$$

According to the literature on dynamic panel data, we use the Arellano-Bover/Blundell-Bond Generalised Method of Moments estimator (system GMM) (Arellano and Bover, 1995; Blundell and Bond, 1998). The two-step method is selected as it is more asymptotically efficient than the one-step (Baltagi, 2005) and, the bias in the standard errors is fixed by means of Windmeijer's (2005) correction procedure. We control for the endogeneity of lagged dependent variable, country's economic structure, country income level, FDI per capita, and level of formal and informal host country institutional voids. Further, some external instruments are added and treated as predetermined variables. Namely, the degree of a country's globalisation; the level of human capital; the internal ethnic and religious tensions, and other dimensions of economic development not included in the model for multicollinearity problems[48].

Finally, before computing our estimates, we run a reverse causality analysis (using the baseline presented in Equation (1)) to rule out the possibility that the presence of electricity infrastructure

[48] The level of a country's globalization is proxied with the *KOF index of globalization* introduced by Dreher (2006). The level of human capital is measured with the *human flight and brain drain* variable (Source: Fund for Peace). The internal tensions are represented by the *group grievance* variable (Source: Fund for Peace). Finally, economic development is expressed by the *poverty and economic decline* variable that aggregates dimensions such as unemployment, youth unemployment, economic deficit, government depth, inflation, purchasing power and GDP growth (Source: Fund for Peace).

attracts FDI, and not the other way around. Results confirm that causality runs from inward FDI to access to electricity growth[49].

5. Results

Table 7 shows our estimates. In Models (1), (2) and (3), informal institutional void is measured by the degree of institutional individualism, while in Models (4), (5) and (6), informal institutional void is measured by the degree of distrust. Models (1) and (4) are our baseline, where we test the impact of FDI per capita on the access to electricity growth, based on the degree of formal and informal institutional voids in the host country. In Models (2) and (5) we add formal institutional proximity, respectively in level and interacted with FDI per capita. Finally, in Models (3) and (6) we add informal institutional proximity, both in level and interacted with FDI per capita

[Insert Table 7 here]

In all models, the lagged dependent variable in level is negative and significant, meaning that the higher the electrification rate at time t-1, the lower the growth rate of the access to electricity at time t.

All control variables maintain a steady and significant sign across all models. Specifically, the country size (population) and the population density contribute positively to the access to electricity growth, while a high rate of rural population curtails it ($p<0.01$). This confirms that an increase in the access to electricity rate passes mainly through the development of electricity infrastructure, which exhibit characteristics of economies of scale and density. The dummy variable LIC is highly negative and significant ($p<0.01$). Reason could be that an important part of the economy of these countries is represented by the mining sector, which brings limited benefits to the local population in terms of access to electricity (WB, 2015). Thus, a recent study of the World Bank on more than four hundred mining projects in the SSA has shown that mining companies often use their own generators or source electricity from the national grid, and only rarely sell the excess power to the grid or electrify the neighbouring rural population (WB, 2015)[50]. For this reason, the negative effect is not that surprising. Finally, as expected, higher level of services value added results in a bigger growth of the access to electricity rate, while industry value added is not significant.

[49] Results of the reverse causality analysis are available upon request.

[50] See https://databox.worldbank.org/Extractives/Africa_PowerMining_Projects_Database/ez5p-5pcx; accessed on 11 June 2016.

Our results confirm that the bigger the host country formal institutional void the smaller the access to electricity growth (D'Amelio et al., 2016). In addition, we find that a high degree of individualism negatively affects the growth of the access to electricity, while the degree of distrust alone is not significant. This means that an important precondition for the success of informal institutions – electricity cooperatives and NGOs - in the provision of electricity is that these institutions operate in societies where community members have a cooperative behaviour. Indeed, high collectivism reduces the costs of monitoring the actions of each other and the probability of free riding (Ostrom, 2000). On the contrary, interpersonal trust alone is not a *sine qua non* precondition for the success of informal institutions in creating alternative solutions for the increase of access to electricity for local population.
Except than in Model (1), FDI per capita does not affect our dependent variable, while it becomes positively and statistically significant when interacted with formal and informal institutional voids. However, in order to understand how the impact of FDI changes based on the degree of host country formal and informal institutional voids, the computation of marginal effects is required, as shown in Equation (2). Results of the marginal effects are displayed in Table 8 and show that FDI stimulates the growth of the access to electricity to local population when host countries suffer from a full institutional void, i.e., not only formal but also of informal institutions are weak (magnitude of 0.02 and $p<0.05$). This confirms our first hypothesis.

[Insert Table 8 here]

In Models (2), (3), (5) and (6) of Table 6, we introduce the formal and informal institutional proximities in line and interacted with FDI per capita. In order to interpret the interaction terms the computation of marginal effects is required, by means of Equation (4). Results are displayed in Table 7 and show that in host countries affected by both formal and informal institutional voids, FDI raises access to electricity only if it comes from countries close in the formal and informal institutional environment. This confirm our second hypothesis. However, our findings reveal that it is much more important to come from countries with similar degree of interpersonal trust (magnitude of 71 and $p<0.05$) than from countries with similar degree of institutional collectivism (magnitude of 0.02 and $p<0.05$).

6. Robustness test

To test the goodness of our results we run our model by using an alternative measurement of quality of informal institutions: the Hofstede's individualism versus collectivism (Hofstede *et al.,* 2010). This variable has a high value when the society is considered individualist, meaning that individuals are

expected to take care of only themselves and their immediate families. On the contrary, the variable has a low value when the society is collectivist, meaning that individuals can expect their relatives or members of a particular group to look after them in exchange for unquestioning loyalty.

Estimates and computed marginal effects are displayed respectively in Tables 9 and 10. Results are in line with those obtained with the other two dimensions of institutional voids, especially with the degree of institutional collectivism sourced from the GLOBE project.

[Insert Table 9 here]

[Insert Table 10 here]

7. Conclusion

In this paper, we add to the literature on the impact of MNEs on host country development. We focus on a specific dimension of development, the access to electricity, and we analyse the phenomenon with the lens on institutional theory (North, 1990; Ostrom, 2000), arguing that low rates of access to electricity derive mainly from the weakness of institutions and that both formal and informal have to be taken into consideration.

Particularly, we study whether and to what extent in a context of formal and informal institutional voids MNEs can alleviate the shortage of access to electricity of the host country . In doing so, we take into consideration the institutional framework not only of the country of destination of the MNEs but also of the country of origin, based on the literature on firm's competitive advantage in developing countries (Kostova and Zaheer, 1999; Cuervo-Cazurra and Genc, 2008). We focus on SSA, a region that in the past 10 years has seen an increasing presence of MNEs, but where only a small proportion of the population has access to electricity.

Our empirical findings, obtained with panel data techniques, reveal that in developing countries affected by formal and informal institutional voids, MNEs can raise access to electricity for local population. However, this is true only when they come from countries similar in both formal and informal institutional environment. The competitive advantage stemming from the similarity in the institutional setting is stronger when informal institutions are also taken into account. MNEs from distrusted societies (i.e., where the level of trust between individuals is low) are especially able to deal with the lack of strong informal institutions and have a bigger impact on the electrification of the developing countries where they invest.

The novelty of the paper is that it integrates the study of MNEs' impact and on the institutional distance, to the study of informal institutions. In doing so, the work adopts a country level prospective and analyses overall the sub-Saharan region, paving the way for future investigations.

For instance, it would be interesting to see if intra-Africa FDI have a different impact compared with other FDI. Then, we could study how it is managed the development of electricity infrastructure by means of MNEs, e.g., which types of partnerships are created with local communities and NGOs. In addition, we could study the impact that the internalisation of societal failures, through the provision of electricity, affects firm performance. The implementation of these ideas rank high in our research agenda

Finally, this paper brings also important managerial and policy implications for both firms' managers and developing countries' governments. Indeed, it could provide guidelines to managers of MNEs operating in developing countries, to understand on which informal institutions' conditions they can leverage to stimulate the development of the countries where they invest. In addition, this work can also support governments and policy makers of developing countries to create sound polices targeted to attract MNEs that, based on the informal institutional settings of the home and host country, can stimulate the energy sector, setting the foundations for the long-term and inclusive development of their countries.

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Table 1. Solutions for the electricity provision in developing countries under different combination of quality of formal and informal host-country institutions.

		Formal Institutions	
		Strong	*Weak*
Informal Institutions	*Strong*	Electricity provided by governments, NGOs and electricity cooperatives through national, off and mini-grids	Electricity provided though mini-grid and off grid systems by NGOs and electricity cooperatives (e.g., electricity cooperatives)
	Weak	Electricity provided by the government through the development of national and mini-grids	Electricity provided by MNEs through the development of national and mini-grids

Sources: Authors' analysis.

Table 2. Home and host country pairs in our dataset.

Home countries			Host countries
Angola	Israel	Saudi Arabia	South Africa
Argentina	Italy	Seychelles	Ghana
Aruba	Japan	Singapore	Mauritius
Australia	Kenya	Slovenia	Angola
Austria	Korea, Rep.	South Africa	Cameroon
Bahamas, The	Lebanon	Spain	Congo, Rep.
Bahrain	Liberia	Sri Lanka	Congo, Dem. Rep.
Belgium	Libya	Swaziland	Gabon
Bermuda	Liechtenstein	Sweden	Kenya
Botswana	Luxembourg	Switzerland	Uganda
Brazil	Madagascar	Taiwan, China	Eritrea
Bulgaria	Malawi	Tanzania	Ethiopia
Canada	Malaysia	Thailand	Botswana
Cayman Islands	Maldives	Togo	Namibia
China	Malta	Turkey	Nigeria
Cote d'Ivoire	Mauritius	United Kingdom	
Cyprus	Morocco	United States	
Czech Republic	Mozambique	Uganda	
Denmark	Namibia	United Arab Emirates	
Finland	Netherlands	Uruguay	
France	New Zealand	Yemen, Rep.	
Germany	Nigeria	Zambia	
Ghana	Norway	Zimbabwe	
Greece	Pakistan		
Hong Kong SAR, China	Panama		
Hungary	Paraguay		
Iceland	Philippines		
India	Poland		
Indonesia	Portugal		
Ireland	Russian Federation		

Source: Sample data from UNCTAD FDI Statistics Division on Investment and Enterprise (http://unctadstat.unctad.org/wds/ReportFolders/reportFolders.aspx) accessed on 15th June 2015.

Table 3. Access to electricity rate in sub-Saharan African host countries, 2005 and 2011.

	2005	2011
	(Households) access to electricity (%)	
Sub-Saharan Africa	53	67
Angola	15	38
Botswana	39	46
Cameroon	47	54
Congo, Dem. Rep.	6	9
Congo, Rep.	20	37
Eritrea	20	32
Ethiopia	15	23
Gabon	48	60
Ghana	49	72
Kenya	14	19
Mauritius	94	99
Namibia	34	60
Nigeria	46	48
South Africa	70	85
Uganda	9	15

Source: Sample data from International Energy Agency (http://www.worldenergyoutlook.org/resources/energydevelopment/energyaccessdatabase/) accessed on 24th May 2016 and authors' calculation.

Table 4. Distribution of FDI per capita by region of origin and country of destination.

	FDI per capita (US dollar)	%
Regions of Origin		
China (w/ Hong Kong)	*18,684*	*6.60*
East Asia (w/o China & Hong Kong)	*4,222*	*1.50*
European Union	*80,385*	*28.60*
India	*7,916*	*2.80*
Latin America & Caribbean	*20,713*	*7.40*
North Africa & Middle East	*6,541*	*2.30*
North America	*55,250*	*19.60*
Oceania	*12,014*	*4.30*
Russia	*153*	*0.10*
South East Asia	*42,543*	*15.10*
South Asia (w/o India)	*1,921*	*0.70*
Sub-Saharan Africa	*30,923*	*11.00*
Total	*281,264*	
	FDI per capita (US dollar)	%
Country of Destination		
Angola	*7,130*	*2.53*
Botswana	*5,575*	*1.98*
Cameroon	*537*	*0.19*
Congo, Dem. Rep.	*59*	*0.02*
Congo, Rep.	*9,830*	*3.49*
Eritrea	*38*	*0.01*
Ethiopia	*38*	*0.01*
Gabon	*10,996*	*3.91*
Ghana	*729*	*0.26*
Kenya	*425*	*0.15*
Mauritius	*202,516*	*72.00*
Namibia	*18,593*	*6.61*
Nigeria	*401*	*0.14*
South Africa	*23,372*	*8.31*
Uganda	*1,024*	*0.36*
Total	*281,264*	

Source: Sample data from UNCTAD FDI Statistics Division on Investment and Enterprise (http://unctadstat.unctad.org/wds/ReportFolders/reportFolders.aspx) accessed on 15th March 2015 and authors' calculation.

Table 5. Formal institutional voids: factor analysis results.

	Formal Institutional Void
Regulatory Quality	0.94
Control of Corruption	0.94
Governance Effectiveness	0.96
Rule of Law	0.96
Voice and Accountability	0.95
Political Stability	0.82

Note: N = 1547.
Source: Authors' calculation.

Table 6. Sample variables descriptive statistics and correlation matrix (N=1 547).

	Variable	Mean	Std. Dev.	Min	Max	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
(1)	Access to electricity	58.91	28.07	5.80	99.00	1																
(2)	Population	29.21	24.55	1.20	160.00	-0.12*	1															
(3)	Rural population	50.72	16.46	13.85	86.75	-0.42*	0.02	1														
(4)	Population density	170.76	205.00	2.46	633.52	0.62*	-0.47*	0.17*	1													
(5)	Industry value added	32.79	13.74	10.39	77.41	-0.16*	-0.27*	-0.49*	-0.28*	1												
(6)	Services value added	55.23	14.12	18.91	70.94	0.63*	0.12*	-0.02	0.40*	-0.60*	1											
(7)	LIC	0.28	0.45	0.00	1.00	-0.59*	0.21*	0.65*	-0.17*	-0.42*	-0.29*	1										
(8)	LMIC	0.13	0.34	0.00	1.00	-0.22*	-0.22*	-0.11*	-0.19*	0.50*	-0.54*	-0.24*	1									
(9)	FDI per capita	181.81	1496.38	0.04	39379.23	0.11*	-0.12*	0.02	0.17*	-0.02	0.07*	-0.07*	-0.01	1								
(10)	Formal institutional voids	1.27	1.00	0.00	3.76	-0.78*	0.19*	0.26*	-0.57*	0.34*	-0.76*	0.46*	0.44*	-0.10*	1							
(11)	Informal institutional voids (Hofstede)	38.67	21.12	15.00	65.00	0.34*	0.39*	-0.45*	-0.26*	-0.03	0.56*	-0.52*	-0.35*	-0.05*	-0.51*	1						
(12)	Informal institutional voids (individualism)	0.53	0.30	0.00	0.85	0.15*	0.26*	-0.57*	-0.44*	0.38*	0.20*	-0.67*	0.05*	-0.05*	-0.11*	0.79*	1					
(13)	Informal institutional voids (distrust)	1200.54	1087.68	0.00	2529.00	-0.17*	-0.34*	0.62*	0.45*	-0.27*	-0.20*	0.56*	0.03	0.07*	0.24*	-0.83*	-0.83*	1				
(14)	Formal institutional proximity	6.57	1.47	0.00	8.57	0.21*	0.11*	-0.13*	-0.03	-0.21*	0.23*	-0.05*	-0.17*	-0.02	-0.32*	0.23*	0.05*	-0.15*	1			
(15)	Informal institutional proximity (Hofstede)	2.75	0.92	0.00	4.45	-0.04*	-0.19*	0.30*	0.24*	-0.04	-0.03	0.07*	0.06*	0.02	0.07*	-0.31*	-0.24*	0.35*	-0.03	1		
(16)	Informal institutional proximity (individualism)	4.88	1.36	0.00	6.71	-0.12*	-0.22*	0.09*	-0.02	0.21*	-0.03	-0.21*	0.10*	0.07*	0.11*	0.01	0.21*	0.07*	-0.28*	0.11*	1	
(17)	Informal institutional proximity (distrust)	8.47	2.00	0.00	9.96	0.03	0.01	-0.04	0.06*	0.01	-0.12*	0.06*	0.06*	-0.03	0.10*	-0.16*	-0.11*	0.15*	-0.11*	-0.13*	-0.09*	1

Source: Authors' calculation. * p<0.10.

Table 7. Estimates system GMM.

	Informal Institutional Void: Degree of Individualism			Informal Institutional Void: Degree of Distrust		
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Host Formal and Informal Institutional Void	Formal Institutional Proximity	Informal Institutional Proximity	Host Formal and Informal Institutional Void	Formal Institutional Proximity	Informal Institutional Proximity
Access to electricity t-1	-0.70***	-0.65***	-0.67***	-0.67***	-0.65***	-0.73***
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.07)
Population t-1	0.16***	0.16***	0.09***	0.14***	0.13***	0.14***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Rural population t-1	-0.39***	-0.37***	-0.25***	-0.47***	-0.45***	-0.55***
	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)	(0.09)
Population density t-1	0.04***	0.033***	0.03***	0.05***	0.05***	0.05***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Industry value added t-1	-0.14	-0.14	-0.09	-0.01	-0.01	0.07
	(0.11)	(0.11)	(0.11)	(0.08)	(0.08)	(0.09)
Services value added t-1	0.34***	0.22**	0.34***	0.30***	0.29***	0.54***
	(0.1)	(0.1)	(0.11)	(0.08)	(0.08)	(0.09)
LMIC	-4.45*	-4.1	-8.13***	5.62***	5.64***	7.80***
	(2.61)	(2.53)	(2.59)	(1.62)	(1.64)	(1.88)
LIC	-24.55***	-21.32***	-27.89***	-	-	-
	(4.37)	(4.09)	(4.08)			
FDI per capita t-1	-0.02**	-0.03	0.04	-0.004	-0.05	-0.003
	(0.02)	(0.03)	(0.04)	(0.004)	(0.04)	(0.004)
Formal institutional void t-1	0.08	-1.34	1.01	-3.50***	-3.96***	-2.92**
	(1.33)	(1.15)	(1.51)	(1.18)	(1.26)	(1.27)
Informal institutional void	-20.22***	-16.90***	-16.67***	-0.001	-0.001	0.001
	(5.61)	(5.02)	(5.37)	(0.001)	(0.001)	(0.001)
FDI per capita t-1 * Formal institutional void t-1	0.003	0.01*	0.01*	0.01*	0.01**	0.01
	(0.003)	(0.004)	(0.01)	(0.003)	(0.003)	(0.004)
FDI per capita t-1 * Informal institutional void	0.02**	-0.02	-0.01	0.001	0.001	-0.001
	(0.01)	(0.02)	(0.02)	(0.001)	(0.001)	(0.001)
Formal institutional proximity t-1	-	-0.02	-	-	-0.09	-
		(0.4)			(0.4)	
FDI per capita t-1 * Formal institutional proximity t-1	-	0.01	-	-	0.01	-
		(0.01)			(0.01)	
Informal institutional proximity	-	-	-3.58***	-	-	0.04
			(0.96)		-	(0.23)
FDI per capita t-1 * Informal institutional proximity	-	-	-0.01	-	-	0.001**
			(0.01)			(0.001)
Constant	56.02***	55.72***	61.58***	37.76***	38.34***	30.34***
	(9.33)	(10.14)	(8.75)	(7.88)	(8.77)	(8.74)
Observations	1,326	1,326	1,326	1,326	1,326	1,105
Number of pair countries	221	221	221	221	221	221
AR(1)	-5.64	-5.58	-5.72	-5.51	-5.57	-5.012
AR(2)	0.63	1.1	0.63	1.2	1.23	0.46
Wald test	220.39	220.71	216.59	221	220.91	218.81

Source: Authors' calculation. Notes: Dependent variable ΔAccess to electricity. Two-step system-GMM. Robust standard errors in parentheses. All AR(1) test statistics statistically significant at the 1 per cent level. All AR(2) test statistics statistically insignificant. All Hansen test statistics statistically insignificant. *** Significant at 1 per cent level. ** Significant at 5 per cent level. * Significant at 10 per cent level.

Table 8. Access to electricity growth: Marginal effects of FDI per capita.

		Informal Institutional Voids: Degree of Individualism	Informal Institutional Voids: Degree of Distrust
Host Formal and Informal Institutional Void (**H1**)		0.02*	0.02*
		(0.01)	(0.11)
Host Formal and Informal Institutional Voids (**H2**)	Formal Institutional Proximity	0.02*	0.04**
		(0.01)	(0.02)
	Formal Institutional Distance	-0.02	-0.02
		(0.03)	(0.03)
Host Formal and Informal Institutional Voids (**H2**)	Informal Institutional Proximity	0.02**	70.95**
		(0.01)	(32.08)
	Informal Institutional Distance	0.07	0.01
		(0.04)	(0.01)

Two-step system GMM. Robust standard errors in parentheses.
*** Significant at 1 per cent level. ** Significant at 5 per cent level. * Significant at 10 per cent level.

Table 9. Hofstede: Estimates system GMM

VARIABLES	(1) Host Formal and Informal Institutional Void	(2) Formal Institutional Proximity	(3) Informal Institutional Proximity
Access to electricity t-1	-0.71***	-0.79***	-0.71***
	(0.05)	(0.06)	(0.05)
Population t-1	0.17***	0.20***	0.17***
	(0.03)	(0.04)	(0.03)
Rural population t-1	-0.39***	-0.45***	-0.39***
	(0.07)	(0.08)	(0.08)
Population density t-1	0.04***	0.04***	0.04***
	(0.01)	(0.01)	(0.01)
Industry value added t-1	-0.22**	-0.04	-0.22**
	(0.11)	(0.13)	(0.10)
Services value added t-1	0.18*	0.45***	0.17*
	(0.10)	(0.12)	(0.10)
LMIC	-3.89	-2.14	-3.84
	(2.46)	(3.08)	(2.42)
LIC	-18.27***	-16.96***	-18.08***
	(3.51)	(4.15)	(3.49)
FDI per capita t-1	-0.01	-0.02	0.001
	(0.01)	(0.02)	(0.01)
Formal institutional voids t-1	-4.24***	-4.37***	-4.16***
	(1.45)	(1.64)	(1.44)
Informal institutional void	-0.20**	-0.27***	0.19**
	(0.09)	(0.10)	(0.09)
FDI per capita t-1 * Formal institutional void t-1	0.01**	0.01*	0.01*
	(0.003)	(0.003)	(0.003)
FDI per capita t-1 * Informal institutional void	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)
Formal institutional proximity t-1		0.45	
		(0.46)	
FDI per capita t-1 * Formal institutional proximity t-1		0.001	
		(0.003)	
Informal institutional proximity			-0.30
			(0.55)
FDI per capita t-1 * Informal institutional proximity			-0.002
			(0.002)
Constant	65.33***	53.60***	69.70***
	(9.92)	(11.85)	(9.70)
Observations	1,326	1,105	1,326
Number of pair countries	221	221	221
AR(1)	-5.42	-4.85	-5.41
AR(2)	1.02	0.09	1.04
Wald test	220.90	219.85	220.87

Source: Authors' calculation.

Notes: Dependent variable ΔAccess to electricity. Two-step system-GMM. Robust standard errors in parentheses.
All AR(1) test statistics statistically significant at the 1 per cent level. All AR(2) test statistics statistically insignificant.
All Hansen test statistics statistically insignificant.

*** Significant at 1 per cent level. ** Significant at 5 per cent level. * Significant at 10 per cent level.

Table 10. Hofstede: Marginal effects of FDI per capita.

Host Formal and Informal Institutional Void	Host Formal and Informal Institutional Voids		Host Formal and Informal Institutional Voids	
	Formal Institutional Proximity	Formal Institutional Distance	Informal Institutional Proximity	Informal Institutional Distance
0.02**	0.03**	0.02	0.02*	0.02
(0.01)	(0.01)	(0.03)	(0.01)	(0.01)

Two-step system GMM. Robust standard errors in parentheses.

*** Significant at 1 per cent level. ** Significant at 5 per cent level. * Significant at 10 per cent level.

Appendix

Table A.1. Formal institutional dimensions of the provision of electricity infrastructure

WORLDWIDE GOVERNANCE INDICATORS (WGIS)[A]	WGI DEFINITION[A]	FORMAL INSTITUTIONAL DIMENSIONS[B]
Government Effectiveness	Quality of public and civil services and the degree of their independence from political pressures. Quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.	Government's ability in directly providing electricity; Credibility of regulatory system.
Political Stability and Absence of Violence and Terrorism	Likelihood of political instability and/or politically motivated violence, including terrorism.	Political stability.
Voice and Accountability	Extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media.	Administrative capabilities of the country; Judicial independence and professionalism.
Regulatory Quality	Ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.	Credibility of regulatory system.
Control of Corruption	Extent to which public power is exercised for private gain as well as 'capture' of the state by elites and private interests.	Credibility of regulatory system; Judicial independence and professionalism.
Rule of Law	Extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.	Administrative capabilities of the country; Judicial independence and professionalism.

Sources: [A] Worldwide Governance Indicators from the World Bank (http://info.worldbank.org/governance/wgi/index.aspx#home) accessed on 13rd July 2015.
[B] Bergara et al., 1998.

A3. PAPER 3

The Impact of FDI on Access to Electricity and Carbon Factor in Developing Countries

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Abstract

There is a longstanding debate on the relative costs and benefits of foreign direct investment (FDI) in developing countries. This paper focuses on Sub-Saharan Africa and analyzes the relationship between FDI and two intertwined dimensions of development, access to electricity and carbon factor. Using a panel of more than 1500 home-host country pairs observed from 2005 to 2011, we estimate the impact of FDI on access to electricity and carbon factor under differing levels of economic development of home and host countries. Our findings reveal that the effect of FDI is neither homogenous nor univocal. FDI from rich economies reduces pressures on the environment in low-income countries, but they slow down the diffusion of electricity. By contrast, when the host country is a middle-income economy, investments from poor countries are more likely to foster access to electricity. However, a high price is paid in terms of more intense carbon factor.

Keywords: FDI, Access to Electricity, Carbon Factor, sub-Saharan Africa

1. Introduction

The interest of researchers and policymakers on the impact of foreign direct investments (FDI) in developing economies has grown over the years, but results have been contradictory and have generated substantial controversies (Caves, 1974; Oetzel *et al.*, 2009). Aside from differences in data and models, the lack of agreement may also be caused by the insufficient recognition of the inherent complexity and breadth of international business effects. Only rarely multidisciplinary and integrated conceptual frameworks and research designs are used to analyze FDI consequences on the economy and society (Giuliani *et al.*, 2014).

Our research aims to contribute to this debate by addressing an exemplary case of the multifaceted consequence of the presence of foreign investors, namely, the impact on both social and environmental dimensions of energy consumption. We analyze, in a country-level perspective, the causal links between FDI, energy development and environmental degradation, as measured respectively by access to electricity and carbon factor.

Whether an inclusive access to electricity can be obtained without sacrificing the quality of environment is a fundamental development challenge, as poorer countries are in desperate need of electricity to improve living conditions of their populations, but they are also concerned with possible environmental side effects of the production and use of electricity services. The paper focuses on sub-Saharan Africa (SSA), as this is the world's area most seriously affected by the shortage of electricity and at the same time is the region that experienced the highest growth of FDI intensity in the last twenty years (IEA, 2014; UNCTAD, 2014). To the best of our knowledge, this is the first effort in this direction.

However, tracking the impact of FDI in terms of an inclusive and environmentally friendly development of the energy sector is not an easy task.

On the one hand, foreign investments, by stimulating economic growth, come to relax budget constraints of the host country's public sector, and in this way spur their ability to develop infrastructure for the production, transmission and distribution of electricity, and electricity above all (Aitken *et al.*, 1999). However, in order to benefit from FDI presence in terms of access to electricity, countries need to have a minimum level of economic development (Gunther, 2002). Poor countries, indeed, are more likely to attract resource-seeking investments, typically from extractive industry. These investments beyond bordering economic growth generally incentivize the building of electricity infrastructure that barely meets public needs, due to the nature of the business (Robbins *et al.*, 2012; Bansal, 2015).

At the same time, FDI influences the environmental quality of host country, mainly through the mediation of economic growth (Dardati *et al.,* 2012; Bansal, 2015). Antweiler *et al*. (2001) decompose the impact of FDI on the environment in three effects, i.e., scale, composition and technical effects. When foreign firms invest in developing counties, economy scales up and changes its sectorial composition (from agriculture to heavy industry or from heavy industry to light industry/services). In addition, the country becomes more able to adopt cleaner

technologies and more sustainable business practices, and tends to implement more stringent environmental regulations.

Another factor that may moderate the electricity access and environmental impact of FDI is the level of economic development of the home country. Even in this case, three effects could be identified: country-of-origin, ratcheting-up and global competition effects. According to the so-called country-of-origin effect, FDI from high-income countries brings cleaner technologies and more environmental sustainable practices. As they are particularly effective in stimulating economic growth, they also foster the development of electricity infrastructure. On the contrary, there is a ratcheting-up effect when the most beneficial investments are those from low and lower-middle income countries, as they suffer a particularly severe lack of legitimacy. In other words, foreign investors from poorer countries have a higher incentive to adopt social and environmental sustainable behaviors (Cuervo-Cazurra *et al.*, 2008). Finally, based on the global competition effect, there is no difference between FDI, as the globalization has generated an overall raise to the top that leads all firms to adopt environmentally- and socially-benign behaviors (Zeng *et al.*, 2012).

In sum, the presence of FDI could have different consequences on the access to electricity and the quality of environment, depending on the stage of economic development of the host and home countries. For this reason, the aim of this paper it to unravel the knot of these complex relationships by studying simultaneously the impact of FDI on both access to electricity and carbon factor, taking into consideration all possible effects than can occur.

For this purpose an empirical analysis is performed. Our sample is composed by a panel dataset of bilateral FDI directed to 15 sub-Saharan countries, observed throughout the period 2005 – 2011, for a total number of 1540 observations. Results are obtained with a bias-Corrected Least Square Dummy Variable estimator (Bruno, 2005).

Our findings reveal that the impact of FDI on the environment and on the access to electricity is not univocal and confirm that it depends on the level of economic development of the host and home country. In poor countries, FDI from rich countries reduce pressure on the environment but freeze the access to electricity. On the contrary, when the host country has reached a certain level of economic development the role of FDI changes. The most beneficial become those from

poor countries, which significantly stimulate access to electricity. However, under these conditions, a high price is paid in terms of environmental degradation, as carbon factor raises.

The paper is organized as follows: Section 2 presents the theoretical background and develops our research questions. Section 3 presents data and methodology, while Sections 4 illustrates our results. Finally, Section 5 reports our discussion and conclusions.

2. Theoretical background

2.1 Electricity and development

The diffusion of electricity access is key to the economic and social development and transition from subsistence agricultural economies to modern industrial and service-oriented societies (Smith *et al.,* 1993; Winkler *et al.,* 2011). In fact, electricity is a key asset for economic development, as it is a necessary input, together with machinery, land, natural resources, and human capital in the productive base of the economy (Winkler *et al.,* 2011). In addition, access to clean and reliable electricity is critical to human welfare and income generation possibilities for the households (Toman *et al.*, 2002). By gaining access to electricity, communities substantially improve their quality of lives, as they have a greater amount of usable time, their health is improved and opportunities for income generating activities increase. For this reason, as an integral part of settlement policies and strategies, a conscious mobilization and allocation of resources for providing adequate electricity supply, and the development of dedicated policies are necessary (IAEA, 2005).

In developing countries, especially in SSA, the most relevant energy problem is what the International Energy Agency (IEA) calls *energy poverty*. Energy poverty is defined as the inability to cook with modern cooking fuels and the lack of a bare minimum of electric lighting to read or for other household and productive activities at sunset (IEA, 2013). Reasons of this serious shortage are complex and vary across countries. In SSA, nevertheless, some common features can be imputed to the reduction in infrastructure investments and maintenance starting from late 80s, caused by the declining receipts of state revenues arising from the commodity price decline of the 1970s, by political and economic instability, by rising debt and by weak economic performances (Robbins *et al.*, 2012). Furthermore, in the region, most of the infrastructure stocks are still a heritage of colonial period, resulting in a qualitative and quantitative mismatching between supply and demand of electricity (Escribano *et al.*, 2010). Finally, the lack of direct

attention reserved by the United Nations Millenium Develompent Goals (MDGs) to the importance of electricity and more generally infrastructure in fostering development has further delayed the underpinning of focal investments[51].

When fostering the uprooting of energy poverty, nevertheless, energy consumption increases and this can have negative consequences on the environment. Hence, several studies show that energy consumption raises greenhouse gas (GHG) emissions, of which carbon emissions are a core part (Soytas *et al*., 2007). GHG emissions from production and consumption activities are one of the major cause of global warming, which is expected to have severe consequences especially on developing countries. Aside from the impact on global warming, the presence of GHG emissions is highly correlated with other local environmental externalities (Kivyiro *et al.*, 2014). For this reason, the side effects of the raise of access to electricity on the environment have to be seriously taken into high consideration by policy makers of developing countries (Nicholls *et al.*, 2010; Wheeler *et al.*, 2013). Hence, electricity is essential for development but it is only a means to an end. The end is good health, high living standards, a sustainable economy and a clean environment (IAEA, 2005). For this reason, access to electricity has to be environmentally sustainable.

2.2 FDI, access to electricity and environmental quality

Between the different solutions that could be adopted to solve the shortage of access to electricity in an environmental sustainable way, the development of the private sector has increasingly been seen as an efficient and conducive tool. However, developing countries have historically been characterized by a mass of private micro and small business activities, with little division of labor and low level of technical capability and productivity and, consequently unable to face complex problems such as energy poverty or environmental degradation (Schulpen *et al*., 2002). For this reason, in the recent years inward FDI, led by multinational companies, has emerged a viable option to partially solve the development challenges of these countries (Caves, 1974; UNCTAD 2014).

Therefore, looking at the access to electricity and environmental quality (as measured respectively by access to electricity and by carbon factor), the analysis of the impact of FDI is

[51] This lack of direct attention to infrastructure has been overcome by the Sustainable Development Goals (SDGs), released by the United Nations in autumn 2015.

inherently ambiguous, as could depend on several contextual influences. Specifically, in this paper we focus on two critical moderating factors, the levels of economic development of host and home countries. A literature survey on this subject is added to the background presented in the Introduction.

Host country income level

Since Caves (1974), empirical studies on the impact of FDI on host countries have proliferated in the economic literature. In line with pro-market perspective, inward FDI improve the level of economic development of the country where they invest, as they are important sources of employment and marketable channels of technology, skills and knowledge transfer (Aitken *et al.*, 1999). From the achievement of economic development objectives, local governments expect positive impact on society (e.g., in terms of quality of education or health system), and the reinforcement of local institutions (Weingast, 2002; North, 2005). The presence of FDI combined with better-funded and reinforced local institutions can in turn stimulate the development of infrastructure for the provision, transmission and distribution of electricity.

Some scholars, nevertheless, strongly criticize this perspective and have shown negative economic impacts of inward FDI in terms of the long-term modernization of productive and infrastructural base (Gunther, 2002). Several studies find that foreign investors crowd out local firms and that technology, knowledge and skills transfers do not occur over the long-term (Aitken *et al.*, 1999). Based on this perspective, FDI could not increase, and sometimes could even reduce, access to electricity in developing countries, as their presence, by undermining in the long run host country's economic growth, might further cut down local government's ability to develop electricity infrastructure. This negative impact could be even stronger when foreign investments are resource-seeking, coming from firms operating in mining, oil extractive and refining industries (Morris *et al.*, 2012). These foreign firms may build new electricity infrastructure for their own business activities. However, benefits to the population could be limited, because the new assets are generally located in remote areas and respond to specific needs in terms of nature of service (e.g., voltage of power grid), which make the advantage of this infrastructure for public purposes less straightforward (Robbins *et al.*, 2012). This problem can be crucial for the poorest countries, especially in SSA, as they strongly depend on the extractive industry, in terms of overall FDI inflows (WB, 2013).

It is then obvious that the impact of FDI on the access to electricity can be either positive or negative, and can strongly depend on the level of economic development of the host country. This leads us to our first two research questions.

RQ(1): What are the effects of FDI on the access to electricity in developing countries?

RQ(2): How do the effects of FDI on the access to electricity depend on the level of economic development of the host country?

A more comprehensive understanding of FDI's effects demands an investigation of implications for the environment. In this paper, we follow the theoretical model developed by Antweiler *et al*. (2001) and we divide FDI impact on environmental quality into scale, composition and technique effects.

The first term is the scale effect, which simply measures the increase of environmental externalities when owing to foreign investments the economy scales-up (Hübler *et al.*, 2010). The composition effect represents a structural shift in the economic activity and can affect either negatively or positively the environment. The sign depends on the sector specialization of the country. According to the pollution haven hypotheses, in low-income countries, the environmental regulation is weak and this may attract FDI from more polluting industries, raising environmental degradation (Cole *et al.*, 2005; Rezza, 2014). Coherently with the Environmental Kuznets Curve studies, nevertheless, environmental degradation can be expected to follow an inverted-U relationship with economic development and its determinants, including inward FDI (Roberts *et al.*, 1997; Dinda, 2004). As FDI increase, countries progress from cleaner stages of earlier economic development, i.e., agricultural specialization, to more polluting activities related to heavy industries, to a cleaner economy related to light industry and service specialization. Since heavier industries are more harmful to the environment, this implies a positive composition effect for countries moving from low income to medium incomes. Later in the development process, activities move from the industry to the service sector or from the heavy to the lighter industry. As the latter is more benign, this means a negative composition effect (Hübler *et al.*, 2010). In addition, at this stage of development, negative composition effect is strengthened by the increasing demand of a cleaner environment, resulting in the adoption of stricter regulations (Antweiler *et al.*, 2001; Dinda, 2004; Dardati *et al.,* 2012). Finally, the technique effect covers the

impact of FDI on the implementation of better and less emission-intensive technologies and management practices and has a positive effect on environmental quality (Oetzel *et al.*, 2009). However, some scholars argue that to be able to absorb, adapt and master foreign cleaner technology and environmental sustainable practices, local people, institutions and firms need to possess a minimum level of educational and technical competences, which strictly depend on the level of economic development of the country (e.g., Meyer *et al.*, 2009).

In conclusion, the impact of FDI on the environment can be either positive of negative, depending on the prevailing effect and, could strictly hang on the level of economic development of the host country, leading to our third and fourth research questions.

RQ(3): What are the effects of FDI on environmental quality in developing country?

RQ(4): How do the effects on environmental quality depend on the level of economic development of the host country?

Home country income level

In recent years, the massive expansion of FDI from less-developed countries has raised the scholars' attention to the role of home country characteristics for developing countries economy and society (e.g., Young *et al*., 1996; Zeng *et al*., 2012). For our purposes, we tackle the level of economic development of the home country and study whether it affects the relationships between FDI, access to electricity and environmental quality. Namely, we argue that three effects dominate the moderating role of the home country's economy: country-of-origin, ratcheting-up and global competition effects (Zeng *et al*., 2012).

The country-of–origin effect suggests that when firms invest abroad they bring with them organizational policies and practices originally developed to accommodate home-country regulation (Kostova *et al*., 1999). For this reason, foreign firms from developed countries are more prone to pay higher wages, transfer more advanced technology, knowledge, and management practices, raising domestic savings, increasing competition and stimulating economic growth (Blömstrom *et al*., 1998). An increase in the host country income level raises the demand for environmental quality and local governments' ability to provide cleaner electricity infrastructure (Antweiler *et al*., 2001; Zeng *et al*., 2012). In addition, thanks to their positive impact on the economy, foreign investors from developed countries tend to be favored

by host governments in the establishment of new businesses. This ownership advantage increases the likelihood that foreign investors from high-income countries invest in electricity infrastructure, which by nature is highly risky. In fact, utility sectors are characterized by important economies of scale and scope, have highly specific and non-redeployable assets and a large range of domestic customers (Levy *et al*., 1994). In sum, the likelihood that FDI stimulate access to electricity is higher if they come from developed rather than developing countries. In addition, despite foreign investors from developing countries tremendously increased since the beginning of 21st century, they are still not prevalent among the largest investors in the world[52]. This implies that firms from developing countries are still more revenues-constrained than the others are and, by definition less capable of affording costly electricity infrastructure investments. Finally, as firm structures, practices, policies and technologies reflect the economic and institutional environment in which they have been developed and established, it is more likely that firms from developed countries import cleaner technologies and less pollutant practices (Kogut *et al.* 1993; Dinda, 2004). Some scholars also argue that, nowadays, the diffusion of these positive technology spillovers could be particularly quick, as workers are becoming increasingly mobile and media and network facilitate corporate knowledge transfer (Zeng *et al.*, 2012). In conclusion, following the country-of–origin effect, firms from high-income countries are more effective in increasing access to electricity and reducing pollution than those from low-income economies.

The ratcheting-up effect is based on the lack of legitimacy that investors from low-income country face with firm stakeholders (e.g., local consumers, shareholders, current and future business partners and consumers in developed export markets) when invest in other developing countries (Lall, 1983; Ramachandran *et al.,* 2010). Legitimacy is the acceptance of the firm by its environment and is vital for firm survival and success (Suchman, 1995). A lack of legitimacy can limit foreign firms' ability to access to host-country resources and, in the age of media, can strongly affect the likelihood of future sales and business opportunities (Mithcell *et al.,* 1997). Recent works suggest that in order to avoid costs related to the lack of legitimacy, low-income

[52] Based on the Fortune Global 500 (FG500) headquarter list, the number of world's largest companies headquartered in emerging and developing countries has grown from 21 in 2000 to 132 in 2014, representing still a minority despite the strong increase. See: http://fortune.com/global500/ Accessed 18 February 2016.

foreign firms assume an environmental constructive behavior in host developing countries and sometimes also adopt voluntary Environmental Management Systems that go above and beyond minimal regulatory compliance at home (Zeng *et al.,* 2012). At the same time, we can expect that firms from a developing country can exploit their managers' ability to deal with low funded governments to offer a signal of their commitment to the society by developing electricity infrastructure (Cuervo-Cazurra *et al.,* 2008). In this choice, they could even be supported by their home governments, reducing the likelihood of opportunistic behavior by local governments (Levy *et al.,* 1994; Cuervo-Cazurra *et al.*, 2008). Further, this effect can generate a competitive dynamics that motivate host country firms to enhance their own environmental performances and to join foreign firms in the development of electricity infrastructure, reinforcing the positive benefits coming from FDI presence. In sum, based on the ratcheting-up effect, FDI from developing countries are more effective in increasing access to electricity and protect the environment than FDI from developed countries.

Finally, accordingly to the global competition effect, the raise of FDI from developing countries has intensified global competition leading to an overall evolution of firms' behavior. This growing competitive pressure has raised stakeholders' normative expectations of what constitute socially acceptable corporate behavior and has pushed foreign firms to increasingly demonstrate environmental protection and social development commitment in their operation abroad, independently on the country of origin. This generates a virtuous circle, where all firms are compelled to adopt environmental friendly policies and to develop electricity infrastructure. This global competition effect could be particularly efficacious in the age of media, where information travels quicker than in the past and commitment to society and environment can raise worldwide customers' willingness to patronize foreign firms and reduce barriers to enter new markets (Cuervo-Cazurra *et al*., 2008; Zeng *et al.*, 2012). Based on this effect, FDI raise both environmental protection and access to electricity, independently on the home country's income level.

Summarizing, on one hand, for the country-of-origin effect, FDI from high-income countries are the most effective in reducing environmental degradation and raising access to electricity in the host economy. On the other hand, the ratcheting-up effect asserts that the most virtuous FDI are those from poor countries. Finally, based on the global competition effect FDI can positive affect

both dimensions independently on the country of origin. Accordingly, our fifth and sixth research questions are as follows.

RQ(5): How do the effects of FDI on environmental quality depend on the level of economic development of the home country?

RQ(6): How do the effects of FDI on access to electricity depend on the level of economic development of the home country?

Graph 1 displays the overall theoretical framework of this paper, tested throughout empirical analysis.

INSERT GRAPH 1 HERE

3. Methodology and data

3.1 Sample and Method

Our sample is composed by 220 investments directed to SSA, observed through 7 years, from 2005 to 2011, leading to a panel dataset of 1540 observations. Table 1 lists bilateral investment countries and the sub-Saharan host countries that compose our sample.

INSERT TABLE 1 HERE

For studying the role of FDI on electricity access and environmental quality, a growth model is adopted (Solow, 1956; Islam, 1995):

$$\Delta y_{i,t} = \alpha_0 + (\alpha - 1) y_{i.t-1} + x'_{i,t-1}\beta + \chi_i + \varphi_t + \varepsilon_{i,t} \qquad (1)$$

$$for\ i = 1, \dots, N\ and\ t = 2, \dots, T$$

Dependent variables

A simultaneous two-equation model is used to describe access to electricity and environmental quality, which are measured following the guidelines provided by the International Atomic Energy Agency (IAEA) in 2005. Two variables are selected: access to electricity and carbon factor.

Growth of access to electricity. This variable is the yearly increase in the percentage of households with access to electricity between time t-1 and t (Source: IEA). According to the IEA, access to electricity involves not only household connection to the grid but also the consumption

of a specified minimum level of electricity[53]. The variable is affected by a problem of missing data, i.e.,, 35 percent of the sample. The issue is overcome by the means of a multiple imputation technique (Allison, 2001)[54].

Growth of carbon factor. This variable is the yearly increase of national carbon emissions per unit of energy use between time t-1 and t. The national carbon emissions are measured in CO_2 equivalent tons and refer to carbon emissions from the combustion of fossil fuels for energy use (Source: World Bank). The unit of energy use is measured by the total primary energy consumption in Kilojoule (KJ), and it includes the country-level consumption of fossil fuels (petroleum, natural gas, coal), hydroelectric, nuclear, and geothermal, solar, wind, and wood and waste electricity, and net electricity imports (Source: International Energy Statistics). This variable is a good proxy of environmental degradation, as carbon emissions are at the origin of global warming and, at the same time, are correlated with other pollutants that are locally noxious, such as nitrogen oxide and sulphur dioxide (Kivyiro *et al.*, 2014). Either in this case multiple imputation techniques are used to fill 20 percent of missing

Independent variables

FDI per capita. For this analysis, we use inward bilateral FDI stocks sourced from the United Nations Conference Trade and Development (UNCTAD). However, since inward FDI stocks constitute an extensive variable, while our dependent variables are intensive, bilateral FDI per capita are employed. The variable, as well, has missing data, i.e., 27 percent, treated by means of multiple imputation.

[53] The consumption threshold was computed by International Energy Agency (IEA) by assuming five people per household and was set equal to 250 kilowatt-hours (kWh) per year for rural households and to 500 kWh per year for urban households (IEA, 2013).

[54] With multiple imputation, missing values are drawn from a distribution of observed variables, including the variables at stake. Multiple imputation is generated by chained equations, i.e., an option suitable for dealing with a high proportion of missing data (Allison, 2001). To guarantee the consistency of imputed data, all paired countries with less than 3 observations per variable, over the 7 years, are removed. The results of the multiple imputation are available upon request from the authors.

Host and home countries' income level. The gross domestic product pro capita (GDP pro capita) is used to measure the level of economic development of both host and home country (Source: World Bank).

Controls

The impact of FDI on access to electricity and environment can depends on a set of factors, including the sectorial composition of the host country and the quality of its institutions. For this reason, as control, we introduce the variable *institutional quality*, which is the factor of the six World Bank Worldwide Governance Indicators (WGIs) and represents the level of development of host institutions. In addition, we add the *industry and service value added* variables, expressed as percentage of GDP, to control for the host's country economic structure (Source: World Bank)[55]. The two variables take on a low value if the country is specialized in agriculture, husbandry, forestry and fishing. In addition, these variables are used to partially overcome the lack of information regarding FDI sectorial composition. In fact, we expect that countries with more developed industry are more likely to attract investments in this sector; countries with a strong focus on services are more likely to attract investments in services and the same reasoning is valid for the primary sector.

We also control for the size of the country, i.e., *population*, for the *population density*, i.e., number of people per square kilometers of land area, and for the entity of *rural population*, expressed as percentage of total population (Source: World Bank). Finally, to reduce the risk of spurious correlations, time and country pair fixed effects are added to our model.

Table 2 shows the descriptive statistics and correlation matrix of variables used for this study. The overall pattern of our variables does not reveal a tendency towards multi-collinearity.

INSERT TABLE 2 HERE

3.2 Estimator and moderating effects

The growth model of the Equation (1) is operationalized as in Equation (2). The basic model is extended by introducing two interaction terms, one between FDI and host country GDP per

[55] Industry value added covers mining, manufacturing, construction, electricity, water and gas. Services value added comprises wholesale and retail trade (including hotels and restaurants), transport, government, financial, professional and personal services, such as education, health care, and real estate services (Source: World Bank).

capita, and the other between FDI and home country GDP per capita. Since the two dependent variables are likely to be linked by simultaneity, each of them is also explained by the other one, which is added to the right hand side of the model.

For the sake of synthesis, we show only the model with access to electricity as dependent variable.

$$\Delta Access\ to\ Electricity_{\ i,t} = \alpha_0 + \alpha_1\ Access\ to\ Electricity_{\ i,t-1} \quad (2)$$
$$+ \beta_1\ FDI\ per\ capita_{\ i,j,t-1} + \beta_2\ GDP\ per\ capita\ host_{\ i,t-1} + \beta_3\ GDP\ per\ capita\ home_{\ j,t-1}$$
$$+ \beta_4\ Carbon\ factor_{\ j,t-1} + \beta_5\ Institutional\ quality\ host_{\ i,t-1} + \beta_6\ Population\ density_{\ i,t-1} +$$
$$\beta_7\ Rural\ population_{\ j,t}$$
$$+ \beta_8\ Populatiion_{\ j,t-1} + \beta_9\ Industry\ value\ added_{\ i,t-1} +$$
$$\beta_{10}\ Service\ value\ added_{\ i,t-1} + \gamma_1\ FDI\ per\ capita_{\ i,j,t-1} *\ GDP\ per\ capita\ host_{\ i,t-1}$$
$$+ \gamma_2\ FDI\ per\ capita_{\ i,j,t-1} *\ GDP\ per\ capita\ home_{\ j,t-1} + \varphi_t + \chi_{j,i} + \varepsilon_{ij,t}$$

Where i is the host country, j is the home country, t is the year, ϕ_t and χ_{ji} are the unobservable year and country-pair fixed effects, respectively; $\varepsilon_{ij,t}$ is the i.i.d. disturbance term. To alleviate reverse causality problems, all variables are lagged by one period.

The marginal effects are evaluated by mean of Equation (3), assuming three level of GDP per capita: minimum, mean and maximum.

$$\left.\frac{\partial(\Delta\text{Access to electricity}_{\text{i,t}})}{\partial(\text{FDI per capita}_{\text{i,j,t}-1})}\right|_{\substack{(GDP\ per\ capita\ host_{i,t-1}) \\ (GDP\ per\ capita\ home_{j,t-1})}} = \quad (3)$$

$$\beta_1 + \gamma_1(GDP\ per\ capita\ host_{\ i,t-1}) \quad + \gamma_2(GDP\ per\ capita\ home_{\ j,t-1})$$

A bias-Corrected Least Square Dummy Variable method (corrected LSDV) is used to estimate the regression coefficients (Bruno, 2005). We prefer this estimator to the more popular generalized method of moments (GMM) (Blundell *et al*., 1998), as it corrects the endogeneity bias of the lagged-dependent variable without the use of any instrumental variables, making estimates more stable and less discretional. Hence, in recent studies corrected LSDV emerged as the most accurate estimator across a range of data limitation, despite the assumption of exogenous explanatory regressors, especially when, as in our case, there is second order serial correlation in the dataset that makes the GMM instruments less reliable (Flannery *et al.,* 2013) [56]. Finally, even

[56] Results related to the second order serial correlation of the dataset are available upon request from the authors.

though a test of reverse causality with respect to FDI reveals that endogeneity of our dependent variables cannot be excluded, results obtained with corrected LSDV can still be regarded as accurate and robust, making the corrected LSDV the best choice for our analysis (Flannery *et al.*, 2013) [57].

4. Results

Tables 3 and 4 present the estimates of models with respectively carbon factor and access to electricity as dependent variables. In regression (A), we include all variables in level and, in regression (B), we expand the specification by adding the two interactions between FDI per capita and home and host country GDP per capita.

INSERT TABLE 3 HERE

INSERT TABLE 4 HERE

In both regressions, the coefficient of institutional quality is significant at 1 percent level and maintains the same magnitude. Higher quality of local institutions corresponds to lower level of carbon factor, meaning that more sound policies for environmental protection are put in place. On the other hand, unexpectedly, higher quality of local institutions correspond to lower level of access to electricity. D'Amelio *et al*. (2015, 2016) can be referred to for a more in-depth analysis of this aspect, as they investigate how FDI impact on the access to electricity based on the level of institutional development of both country of origin and destination

Greater population corresponds to higher growth of carbon factor and lower growth of access to electricity. This is coherent with the claim of many scholars and policy makers. Fast growth of population, especially in SSA, remains the main challenge to electrification process and environment protection, despite the raise of investments in new more efficient electricity supply services (IEA, 2014).

Countries with a high percentage of rural population have less problems of environmental degradation, as generally these countries are in the early stage of economic development (Hübler *et al.*, 2010). Surprisingly, we do not find evidences of the impact of rural population and population density on the access to electricity, nor of the relationship between population density and level of carbon factor.

[57] Results related to the reverse causality are available upon request from the authors.

The sectorial composition of the host economy bears on our dependent variables only in the latest phases of development process, when activities move from industry to services. Results, indeed, reveal that only an increase in the services value added reduces carbon factor and stimulates access to electricity.

Turning to our main independent variable, i.e., FDI per capita, when the variable is simply inserted in level it takes a significant and negative coefficient on the carbon factor (see regression A in Table 3), while its coefficient is insignificant when access to electricity is adopted as dependent variable (see regression A in Table 4). In order to gauge the role of home and host countries' income, marginal effects are calculated and results are summarized in Table 5.

INSERT TABLE 5 HERE

Looking at Table 5 what emerges is that FDI negatively and significantly reduce carbon factor when host country GDP pro capita is at the minimum and mean level and home country GDP pro capita is at the maximum level. On the contrary, FDI from poor countries directed to rich economies increase carbon factor. This means that when host country is at the low or middle-low income level it benefits from the presence of FDI because they bring cleaner technology and more sustainable management practices for the protection of the environment, i.e., technique effect. This is more likely to be true, if FDI come from high-income countries, as foreign firms' technologies and practices reflect economical and institutional development at home (i.e., country-of-origin effect). Therefore, when host country has reached a certain level of economic development the composition and scale effects prevail on the technology one. In fact, the economy scales up and moves from an agricultural to an industrial specialization. At this stage of development, the most noxious FDI are those from poor countries, always in line with the country-of-origin effect.

Turning to access to electricity (Table 5), marginal effects show that the impact of FDI is inverted than this on the environment. While FDI from rich to poor countries reduce carbon factor, they slow down the electrification process, undercutting host country social development. On the contrary, FDI from poor to rich countries are highly beneficial in terms of access to electricity but they increase carbon factor, polluting the environment. A possible explanation could be that when host country is a low or lower-middle income the likelihood that FDI are resource seeking, coming from extractive industry, is higher. Consequently, it is more probable that foreign firms,

which made the FDI, develop private electricity infrastructure difficult to exploit for welfare services, due to their specific characteristics (e.g., they are located in remote areas or the voltage of power grid does not match with national grid requirements) (Morris *et* al., 2012). This means that local governments are not able to exploit the presence of foreign firms for public purposes. On the contrary, host countries at a higher stage of economic development are more able to absorb benefits coming from inward FDI. At this stage, FDI are more effective in stimulating social and economic growth and raise local government's ability to develop and maintain electricity infrastructure. In the end, marginal effects confirm the presence of a ratcheting-up effect: foreign investors from developing countries are more prone and more effective to develop electricity infrastructure than those from developed economies, as they need to overcome the lack of legitimacy, coming from the economic conditions of their home countries.

Finally, some words should be spent to describe the relationship between carbon factor and access to electricity. Our estimates show that an increase in the access to electricity slows down the growth of carbon factor and vice versa (significant at 1 percent level). This result seems logical, as an increase of access to electricity is strictly related with implementation of more sound policies for the protection of the environment and reduction of pollution.

As a robustness check, models are run removing one-by-one all host countries from our sample. Our main results appear quite robust and not driven by one specific host country[58].

5. Discussion and conclusions

This paper addresses the effect of FDI on the access to electricity for developing countries. A comprehensive analysis has been done to disentangle the social and environmental dimensions of access to electricity and to model external contingencies such as the stage of economic development of recipient and origin countries. We demonstrate that FDI could be instrumental in developing the electricity sector, but impact is neither univocal nor homogenous.

Namely, poor countries benefit only from the presence of FDI from rich countries, and only from an environmental point of view. We interpret this result according to the country-of-origin effect of Zeng *et al.* (2012): FDI from rich countries is expected to import technologies and business practices that are cleaner and more sustainable than those adopted by domestic firms are. In the

[58] Results of the robustness check are available upon request from the authors.

majority of cases, however, poor countries tend to attract mainly resource-seeking investments, generally coming from extractive industry. This type of investment in not effective in fostering economic growth, undermining the local economy's ability to develop infrastructure for the production, transmission and distributions of electricity to the population. In addition, even though extractive companies invest in new infrastructure, as they are useful for their business activities, they build assets that probably could not be used for public purposes, because of the specific location or technical standards.

The impact of FDI is reversed when host country has already reached a certain level of economic development. In this situation, indeed, foreign investments from poor country are more likely to have positive effects than FDI from richer countries. However, these positive effects are concentrated only on the social dimension of electricity access, while they are negative if we look at the environmental quality. Developing country foreign investors appear effective in fostering access to electricity. Our conjecture is that they need to fill a larger gap in legitimacy with their stakeholders, compared with those from developed country. To do it, they implement legitimation strategies that allow exploiting management knowledge and capabilities developed at home. The construction of electricity infrastructure for private and public purposes could be one these strategies, as it consents to leverage on the ability of managers to deal with challenging and budget constrained environments. FDI from developing countries, nevertheless, entails negative consequences on the environment, as investors from these countries still have a strong technological disadvantage or adopt business practices that are constrained by the economic development of their countries of origin.

We are aware that this work is not immune from limitations. First, the focus on one specific region, SSA, allows controlling for the region fixed effects but border the generalizability or our results. Then, the adoption of country level data constrains the study to a correlation analysis. It does not permit to test if effectively the diffusion of electricity access is done through the development of electricity infrastructure and, how environmental quality is guaranteed by foreign investors. A micro level analysis and the extension to other regions, starting from the developing ones, would be needed to overcome these limits. Both of them rank high in our research agenda.

Despite these limitations, nevertheless, we believe that this paper brings an important contribution to the ongoing debate over the impact of inward FDI on developing countries' development, emphasizing the importance of electricity as a viable and fundamental tool for development and the moderating role of home and host country characteristics.

Finally, important policy implications could be derived from this work for both business managers and policy makers. Indeed, a clearer understanding of how foreign firms' activities influence the development of the countries where they invest and their communities, can help managers to better select countries wherein expand their business activities and to better evaluate the consequences of their presence. Further, this paper could be a guideline for governments and policy makers of developing countries to create sound policies target to attract FDI that can stimulate the electricity sector in an environmental sustainable way, setting the foundations for the long-term and inclusive development of their countries.

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TABLE 1. *List of home-host country pairs and of host sub-Saharan countries in our sample.*

Home - Host Country Pair								SSA Host Countries
Angola	SouthAfrica	France	Congo	Luxembourg	SouthAfrica	Spain	Mauritius	Angola
Argentina	SouthAfrica	France	Gabon	Madagascar	SouthAfrica	Spain	SouthAfrica	Botswana
Aruba	SouthAfrica	France	Ghana	Malawi	SouthAfrica	SriLanka	Mauritius	Cameroon
Australia	Ghana	France	Kenya	Malaysia	Mauritius	Swaziland	Botswana	Congo
Australia	Mauritius	France	Mauritius	Malaysia	SouthAfrica	Swaziland	SouthAfrica	DemRepCongo
Australia	SouthAfrica	France	SouthAfrica	Maldives	SouthAfrica	Sweden	Ghana	Eritrea
Austria	Mauritius	France	Uganda	Malta	Mauritius	Sweden	Mauritius	Ethiopia
Austria	SouthAfrica	Germany	Ghana	Malta	SouthAfrica	Sweden	SouthAfrica	Gabon
Bahamas	Mauritius	Germany	Kenya	Mauritius	Botswana	Sweden	Uganda	Ghana
Bahamas	SouthAfrica	Germany	Mauritius	Mauritius	Ghana	Switzeland	SouthAfrica	Kenya
Bahrain	SouthAfrica	Germany	SouthAfrica	Mauritius	SouthAfrica	Switzerland	Botswana	Mauritius
Belgium	Angola	Ghana	SouthAfrica	Mauritius	Uganda	Switzerland	Ghana	Namibia
Belgium	Cameroon	Greece	SouthAfrica	Morocco	Cameroon	Switzerland	Kenya	Nigeria
Belgium	Congo	HongKong	Botswana	Morocco	Congo	Switzerland	Mauritius	SouthAfrica
Belgium	DemRepCongo	HongKong	Mauritius	Morocco	Gabon	Taiwan	SouthAfrica	Uganda
Belgium	Gabon	HongKong	SouthAfrica	Mozambique	SouthAfrica	Tanzania	SouthAfrica	
Belgium	Kenya	Hungary	SouthAfrica	Namibia	SouthAfrica	Thailand	SouthAfrica	
Belgium	Mauritius	Iceland	SouthAfrica	Netherlands	Angola	Togo	Ghana	
Belgium	SouthAfrica	India	Botswana	Netherlands	Botswana	Turkey	Ethiopia	
Belgium	Uganda	India	Ghana	Netherlands	Cameroon	Turkey	SouthAfrica	
Bermuda	SouthAfrica	India	Mauritius	Netherlands	Ghana	UK	Botswana	
Bermuda	Uganda	India	SouthAfrica	Netherlands	Kenya	UK	Ghana	
Botswana	SouthAfrica	India	Uganda	Netherlands	SouthAfrica	UK	Kenya	
Brazil	Angola	Indonesia	Mauritius	Netherlands	Uganda	UK	Mauritius	
Brazil	SouthAfrica	Ireland	Mauritius	NewZeland	SouthAfrica	UK	Nigeria	
Bulgaria	SouthAfrica	Ireland	SouthAfrica	Nigeria	Ghana	UK	SouthAfrica	
Canada	Ghana	Israel	SouthAfrica	Nigeria	SouthAfrica	UK	Uganda	
Canada	Mauritius	Italy	Angola	Norway	Angola	USA	Angola	
Canada	SouthAfrica	Italy	Congo	Norway	Ghana	USA	Botswana	
Cayman	Mauritius	Italy	DemRepCongo	Norway	Kenya	USA	Cameroon	
China	Angola	Italy	Eritrea	Norway	SouthAfrica	USA	Congo	
China	Cameroon	Italy	Ethiopia	Pakistan	Mauritius	USA	Eritrea	
China	Congo	Italy	Gabon	Pakistan	SouthAfrica	USA	Ethiopia	
China	DemRepCongo	Italy	Ghana	Panama	SouthAfrica	USA	Gabon	
China	Eritrea	Italy	Kenya	Paraguay	SouthAfrica	USA	Ghana	
China	Ethiopia	Italy	SouthAfrica	Philippines	Mauritius	USA	Kenya	
China	Gabon	Japan	SouthAfrica	Philippines	SouthAfrica	USA	Mauritius	
China	Ghana	Kenya	Ghana	Poland	SouthAfrica	USA	Nigeria	
China	Kenya	Kenya	Mauritius	Portugal	Angola	USA	SouthAfrica	
China	Mauritius	Kenya	SouthAfrica	Portugal	Kenya	USA	Uganda	
China	SouthAfrica	Kenya	Uganda	Portugal	SouthAfrica	Uganda	SouthAfrica	
Coted'Ivoire	Ghana	KoreaRep	Angola	Russia	SouthAfrica	UnitedArabEmirates	Ghana	
Cyprus	SouthAfrica	KoreaRep	Cameroon	SaudiArabia	Mauritius	UnitedArabEmirates	Mauritius	
CzechRep	Mauritius	KoreaRep	Congo	Seychelles	Mauritius	UnitedArabEmirates	SouthAfrica	
CzechRep	SouthAfrica	KoreaRep	DemRepCongo	Seychelles	SouthAfrica	Uruguay	SouthAfrica	
Denmark	Angola	KoreaRep	Ethiopia	Singapore	Ghana	Zambia	SouthAfrica	
Denmark	Cameroon	KoreaRep	Gabon	Singapore	Mauritius	Zimbabwe	Botswana	
Denmark	Congo	KoreaRep	Kenya	Singapore	SouthAfrica	Zimbabwe	Mauritius	
Denmark	Ghana	KoreaRep	SouthAfrica	Singapore	Uganda	Zimbabwe	SouthAfrica	
Denmark	Kenya	Lebanon	Ghana	Slovenia	Gabon			
Denmark	Mauritius	Liberia	Botswana	SouthAfrica	Angola			
Denmark	SouthAfrica	Liberia	SouthAfrica	SouthAfrica	Botswana			
Finland	DemRepCongo	Libya	SouthAfrica	SouthAfrica	Ghana			
Finland	Mauritius	Liechtenstein	SouthAfrica	SouthAfrica	Kenya			
Finland	SouthAfrica	Luxembourg	Botswana	SouthAfrica	Mauritius			
France	Angola	Luxembourg	Ghana	SouthAfrica	Namibia			
France	Cameroon	Luxembourg	Mauritius	SouthAfrica	Uganda			

Source: UNCTAD

TABLE 2. *Model variables descriptive statistics and correlation matrix (No. observations= 1540).*

	Variable	Mean	Std. Dev.	Min	Max	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1)	Access to Electricity	58.95	28.13	5.80	100	1										
(2)	Carbon Factor	6.46	2.15	0.18	12.80	0.1402*	1									
						0.0000										
(3)	FDI per capita	180.16	1498.48	0.04	39379.23	0.1119*	-0.0362	1								
						0.0000	0.1565									
(4)	GDP per capita host	3891.31	2426.92	159.70	7005.90	0.7255*	0.2431*	0.1077*	1							
						0.0000	0.0000	0.0000								
(5)	GDP per capita home	25488.09	21023.99	185.96	117493.6	-0.0954*	-0.0384	0.0457*	-0.1235*	1						
						0.0002	0.1323	0.0732	0.0000							
(6)	Institutional quality	0	1	-2.49	1.27	0.7881*	0.974*	0.0999*	0.6411*	-0.0880*	1					
						0.0000	0.0001	0.0001	0.0000	0.0005						
(7)	Population	29.24	24.55	1.20	160	-0.1173*	0.2260*	-0.1156*	-0.1952*	-0.0293	-0.1841*	1				
						0.0000	0.0000	0.0000	0.0000	0.2500	0.0000					
(8)	Rural population	50.70	16.45	13.85	86.75	-0.4221*	-0.3263*	0.0207	-0.6129*	0.0922*	-0.2627*	0.0218	1			
						0.0000	0.0000	0.4167	0.0000	0.0003	0.0000	0.3934				
(9)	Population density	170.82	205.37	2.46	633.52	0.6164*	-0.2072*	0.1693*	0.2941*	0.0153	0.5692*	-0.4689*	0.1673*	1		
						0.0000	0.0000	0.0000	0.0000	0.5474	0.0000	0.0000	0.0000			
(10)	Industry value added	32.81	13.76	10.39	77.41	-0.1759*	0.2877*	-0.0123	0.2918*	0.0034	-0.3389*	-0.2689*	-0.4885*	-0.2828*	1	
						0.0000	0.0000	0.6296	0.0000	0.8937	0.0000	0.0000	0.0000	0.0000		
(11)	Services value added	55.23	14.14	18.91	70.94	0.6695*	0.0458*	0.0723*	0.4468*	-0.0790*	0.7630*	0.1219*	-0.0212	0.4031*	-0.5890*	1
						0.0000	0.0727	0.0046	0.0000	0.0019	0.0000	0.0000	0.4058	0.0000	0.0000	

Source: Authors' calculation

TABLE 3. *The impact of FDI on carbon factor (summary of corrected LSDV estimates).*

VARIABLES	(A) Baseline	(B) Income level
Carbon factor t-1	-0.5820***	-0.5824***
	(0.037)	(0.037)
Access to electricity t-1	-0.0107***	-0.0106***
	(0.002)	(0.002)
Institutional quality t-1	-0.0964***	-0.0911***
	(0.000)	(0.034)
Population t-1	0.0048	0.0047*
	(0.003)	(0.003)
Rural population t-1	-0.0150**	-0.0151*
	(0.008)	(0.008)
Population density t-1	0.0002	0.0002
	(0.000)	(0.000)
Industry value added t-1	0.0075	0.0075
	(0.006)	(0.007)
Services value added t-1	-0.0061**	-0.0060*
	(0.003)	(0.003)
FDI per capita t-1	-0.0001***	-0.0002
	(0.000)	(0.001)
GDP per capita host t-1	0.0002	0.0002
	(0.000)	(0.000)
GDP per capita home t-1	-0.0000	-0.0000
	(0.000)	(0.000)
FDI per capita t-1 * GDP per capita host t-1		0.0000
		(0.000)
FDI per capita t-1 * GDP per capita home t-1		-0.0000
		(0.000)
Country-pair fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Observations	1,320	1,320

Source: Authors' calculation.
Notes: Dependent variable ΔCarbon Factor.
Corrected LSDV. Standard errors in parentheses.
*** Significant at 1 percent level. ** Significant at 5 percent level. * Significant at 10 percent level.

TABLE 4. *The impact of FDI on access to electricity (summary of corrected LSDV estimates).*

	(A)	(B)
VARIABLES	Baseline	Income level
Access to electricity t-1	-0.9287***	-0.9283***
	(0.050)	(0.051)
Carbon factor t-1	-0.9257***	-0.9187***
	(0.007)	(0.024)
Institutional quality t-1	-1.0583***	-1.0383***
	(0.151)	(0.117)
Population t-1	-0.0338	-0.0333*
	(0.023)	(0.017)
Rural population t-1	-0.0673	-0.0684
	(0.058)	(0.059)
Population density t-1	0.0012	0.0012
	(0.002)	(0.001)
Industry value added t-1	-0.0653	-0.0665
	(0.040)	(0.043)
Services value added t-1	0.0945***	0.0992***
	(0.012)	(0.019)
FDI per capita t-1	-0.0000	0.0008
	(0.000)	(0.009)
GDP per capita host t-1	-0.0002	-0.0002
	(0.003)	(0.003)
GDP per capita home t-1	0.0001	0.0001
	(0.000)	(0.000)
FDI per capita t-1 * GDP per capita host t-1		0.0000
		(0.000)
FDI per capita t-1 * GDP per capita home t-1		-0.0000**
		(0.000)
Country-pair fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Observations	1,320	1,320

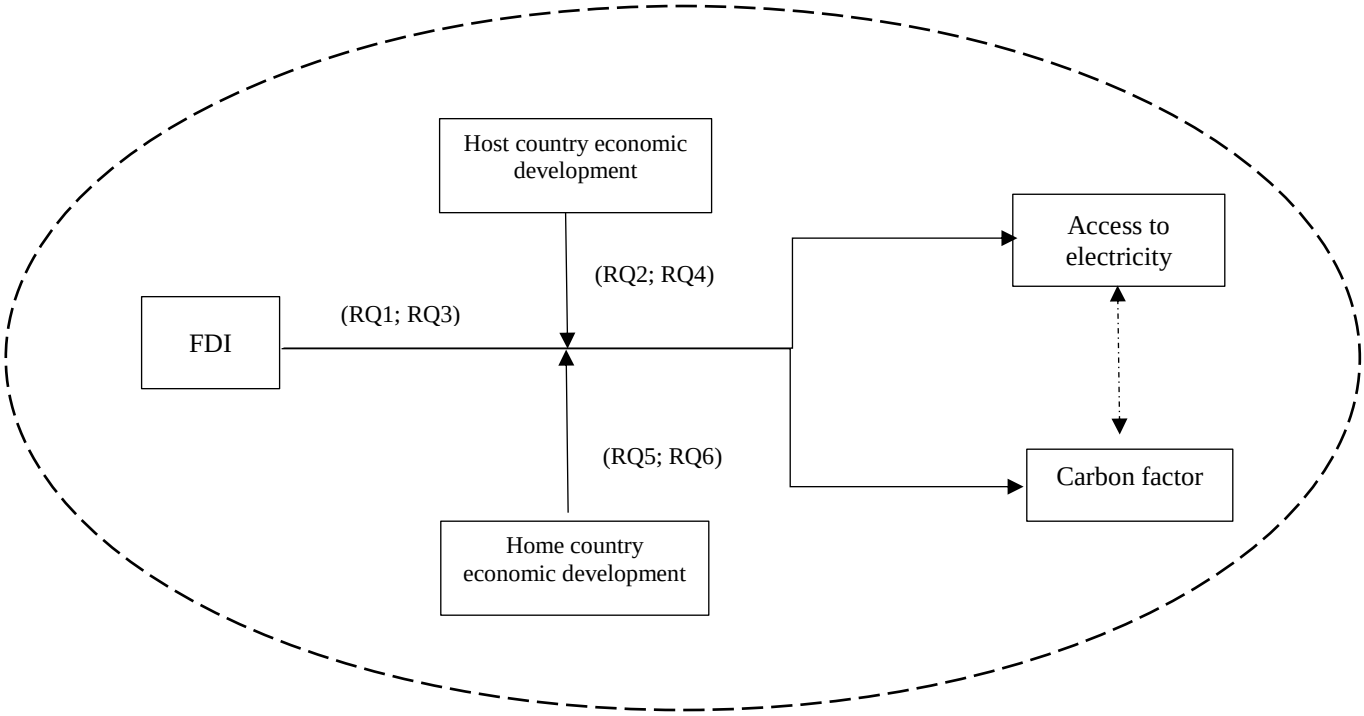
Source: Authors' calculation.
Notes: Dependent variable ΔAccess to Electricity.
Corrected LSDV. Standard errors in parentheses.
*** Significant at 1 percent level. ** Significant at 5 percent level. * Significant at 10 percent level.

TABLE 5. *The impact of FDI moderated by home and host income levels: Marginal effects.*

	Dependent Variable: ΔCarbon Factor			Dependent Variable: ΔAccess to Electricity		
Host \ Home	Min	Mean	Max	Min	Mean	Max
Min	-0.0003	-0.0004	-0.0001*	0.0008	-0.002	-0.0122***
	(0.011)	(0.001)	(0.001)	(0.009)	(0.008)	(0.003)
Mean	-0.0001	-0.0002	-0.0005***	0.0001**	0.0001	-0.0003
	(0.001)	(0.001)	(0.011)	(0.001)	(0.001)	(0.001)
Max	0.0001**	0.0001	-0.0003	0.0054***	0.0026***	-0.0076
	(0.001)	(0.001)	(0.001)	(0.001)	(0.009)	(0.005)

Note: Standard errors in parentheses.
Source: Authors' calculation

Graph 1. *Theoretical Framework: Scheme.*



A4. PAPER 4

Corporate Political Activities and Corporate Social Responsibility and their Impact on Firm Performance

A study on the electricity sector in sub-Saharan Africa

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Keywords: Non-market strategy, corporate political activity, corporate social responsibility, electricity, Africa, dictionary-based content analysis

Abstract

In this paper, we develop an integrated framework to study the impact of firms' non-market strategies, i.e., corporate political activity and corporate social responsibility, on their performances. Four performance types are examined: reputation, internal efficiency, access to strategic resources and, economic performance. We employ a dictionary-based content analysis to measure firm non-market strategy and performance and we conduct a Tobit estimation to test the association between these variables. Our sample is composed by firms that invested in electricity infrastructure projects in sub-Saharan Africa from 2000 to 2014 and are part of the supply chain of the electricity sector. Results show that each dimension of performance has a different degree of sensitivity to the two types of non-market strategies.

1. INTRODUCTION

Globalization and the emergence of major global challenges such as poverty, climate change, and migration has exerted increased pressure on firms to consider the social impact of their activities and to contribute positively to socio-economic development of the societies within they operate (Gratton, 2014). For this reason, the private sector is increasingly engaged in consideration of

these global challenges, and has become part of various global initiatives such as the United Nations Global Compact, the World Business Council for Sustainable Development and, the Global Reporting Initiatives (Kolk, 2016).

In order to address these global challenges while also generating a return for shareholders, firms increasingly complement the more traditional market strategies with non-market ones (Boddewyn and Doh, 2011; Hillman et al., 2004). However, their involvement in non-market initiatives may require resources and generate opportunity costs that may undermine their financial performance (Porter, 1991). For these reasons, management and strategy scholars have for several decades examined the influence of nonmarket strategies on social and financial performance (Baron, 1995; Doh *et al*., 2012; Lawton *et al*., 2014; Luoma, 2015; Melahi *et al.,* 2016; Porter, 1991). Most of these studies, however, center on a particular nonmarket strategy (e.g., corporate political activity or corporate social responsibility) (Nakpodia *et al*., 2016; Rathert, 2016) or on a single dimension of performance, generally economic or financial (Al-Matari *et al*., 2014; Kaplan and Norton, 1992).

The goal of our study is to overcome these limitations by disentangling the analysis of performance, unpacking non-market strategies and considering their impact on performances in an integrated fashion. Specifically, we consider four dimensions of performance: economic performance, reputation with local stakeholders, organization efficiency, and access to strategic resources. In addition, we examine non-market strategies in a more finely variegated fashion by incorporating both corporate social responsibility (CSR) and corporate political activity (CPA) (Melahi *et al*., 2016).

For this purpose, we focus on a particular region, i.e., sub-Saharan Africa, which so far has received less attention that it deserves. Indeed, despite this development challenge and despite the perception that most of the countries of the region are suffering from political instability and high corruption, sub-Saharan Africa has experienced an unprecedented growth of firms' presence in the last ten years, becoming an increasingly attractive place to compete (UNCTAD, 2014). These positive and negative dynamics makes sub-Saharan Africa a very interesting setting for this study.

The framework is tested using a Tobit model that incorporates 93 firm-project pairs comprised of private firms and their electricity infrastructure projects in sub-Saharan Africa over the period

2000 - 2014. In constructing our indicators, we conduct a dictionary-based content analysis (Jung and Pompper, 2014; Kohlbacher, 2006; Milne and Adler, 1999; Vourvachis, 2007) in which we automatically coded more than 5000 documents extracted from different sources.

Results of our analysis confirm that, generally speaking, in sub-Saharan Africa non-market strategies are important. However, in this context it is more effective to leverage on CPA rather than on CSR activities. The two types of non-market strategies are equally effective only when the aim of the firm is to optimize its internal process and organizational efficiency. The reason of the higher effectiveness of CPA initiatives (compared with the CSR ones) could be imputed to the political instability that characterizes many countries of sub-Saharan Africa. Indeed, in a context of political instability, CPA strategies help firms to shape the regulatory environment (e.g., reduce government regulation on the private sector) or to affect government decision process (e.g., obtain licensing, access to strategic assets or win public calls) (Frynas and Stephens, 2015). In addition, in most of the countries of the region, there are strong resource dependencies between firms and governments, which oblige firms to develop political connections to access critical political resources and protect them self from the risk of political extortion (Hillman and Keim, 2001).

The paper is organized as follows. In Section 2, we give an overview of the main researches done on performance and non-market strategies and their linkages. In Section 3, we develop our conceptual framework and we present our research questions. Section 4 describes the methodology used to build up performance and strategy indicators and to test their linkages. In Section 5, we present our results; while in Section 6 we discuss the main take-away and conclude.

2. LITERATURE REVIEW

The linkages between performance and strategy have been widely investigated by management and strategy scholars (Luoma, 2015; Porter, 1991). Hence, the concept of performance directly derives from questions such as “why firms differ, how they behave, how they choose strategies and how they are managed” (Porter, 1991, p.108). The study of these linkages poses several challenges and have been analyzed from different angles. In this section, we provide an overview of these challenges and of the different angles of analysis.

2.1 Measuring Firm Performances

One of the first issue raised by scholars interested in the linkages between strategy and performance has been how to measure performance. The most widely employed indicators have historically been financial and/or accounting-based measures, such as return on assets (ROA), return on equity (ROE), return on sales (ROS), profit margin (PM), return on investment (ROI), earning per share (EPS), operating profit (OP), or return on capital employed (ROCE) (Al-Matari *et al*., 2014). However, these measures have been largely criticized because they provide a limited short-term view of performance and are thereforean incomplete in understanding the firm's position (Kapopoulos and Lazaretou, 2007). For this reason, the most recent studies point to a variety of links between firm strategy and different dimensions of performance, such as consumer perception, access to finance, preferential access to political resources or improved relationships with primary stakeholders (Frynas *et al*., 2006; Hillman and Keim, 2001; Madsen and Rodgers, 2015).

2.2 Non-Market Strategies

As such, when considering strategies firms employ to improve performance, both market and nonmarket forces have to be taken into account. The formers include those interactions between the firm and other parties that are intermediated by markets or private agreements (e.g., customers and suppliers) (Baron, 1995). The latter are primarily non-economic activities designed to favorably positioning the firm in its nonmarket environment, such as obtaining permission from authorities, securing legitimacy from non-governmental organizations (NGOs) or improving relationships with local communities (Boddewyn and Doh, 2011; Doh *et al*., 2012; Lawton *et al*., 2014). The effect of market strategies on firm performance has been widely investigated by strategy and international business scholars (D'Aveni, 1994; Baron, 1995; Aggarwal, 2001). For this reason, in this paper we focus entirely on non-market strategies and their impact on a nuanced set of performances.

Literature on non-market strategies suggests that non-market strategies can be broken in two types: CSR and CPA (Mellahi *et al.,* 2016). In particular, Meznar and Nigh (1995) claim that CPA and CSR correspond to two different types of mechanisms: buffering and bridging, which are complementary and not mutually exclusive. On one side, CSR are activities that bridge with the environment where the firm operates (i.e., bridging mechanisms). They allows firms to connect

with the external environment in the attempt to conform to the external expectations (Meznar and Nigh, 1995). On the other side, CPA are activities that buffer from the social and political environment (i.e., buffering mechanisms); they are implemented by firm's managers either to try to protect themselves from external interferences or to actively influence their environment through political actions, lobbying and advocacy (Meznar and Nigh, 1995).

Scholars have provided many definitions of CSR. One view is that CSR is a higher-order construct that encompasses policies, processes and practices that are put in place by firms to attend societal demands and/or expectations (Carroll, 1979). Hence, the reasons firms engage in CSR activities are many and in recent years, the conceptualization of the social responsibilities of firms – especially those operating across borders – has grown (Kolk, 2016). Given this, Prahalad (2006) argues that firms can be part of comprehensive solutions to societal problems by developing market-based solutions and this can be a source of new business opportunities, innovation and competitive advantage. In this regard, many scholars have examined the impact of CSR initiatives on firms' performance, with quite mixed results (for an overview see Aguinis and Glavas, 2012). Some studies have found that CSR activities raise reputation, consumer loyalty and positive firm evaluations, stakeholder relations, financial performance and, firm capabilities (e.g., operational efficiency, product quality, demographic diversity), as well as enhance organizational identification, employee engagement, organizational citizenship behavior, attractiveness to potential employees and, help firms mitigate risks (Aguinis and Glavas, 2012; Getz, 2001). In addition, some studies have found positive relationships between CSR and share performance (Ioannou & Serafeim, 2015). Another group of scholars has found that firms often approach CSR as part of organizational inertia and fail to integrate CSR with broader strategy. This approach may push firms to blindly finance any good cause without strategically focusing on a specific issue or area (Burke and Logsdon, 1996). Thus, without a solid strategic base behind CSR implementation, firms waste valuable resources in social initiatives that do not actually generate value neither for the company neither for the society (Friedman, 1970; Porter and Kramer, 2006).

The second typology of non-market strategy is CPA. Hillman *et al.* (2004) define CPA as political attempts to manage political institutions and influence political actors in ways favorable to the firm. Originally, CPA has been treated as an internal branch of the CSR literature. Firms' political

interactions were seen as the political lens of social strategic actions (Frynas and Stephens, 2015); it is only in the late 90s that political actions started to be studied separately from social ones. The study of CPA has often been related to its impact on firm performance. An extensive body of literature claims that CPA and performance are positively related. Frynas et al. (2006), for instance, find that political strategies lead to first-mover advantages; while McWilliams *et al*. (2002) demonstrate that CPA raises firm-specific advantages because allows firms to manipulate regulation and raising rivals' costs. In addition, Shaffer and Hillman (2000) demonstrate that a positive relation exists between CPA strategies and various performance dimensions, such as gross profit margin and market shares' increase. Finally, Hillman *et al.*, (1999) show that firms raise returns to shareholders when the top management collaborate with federal office. Nonetheless, there may be tensions between CPA and performance. For instance, Li, *et al.* (2009) found that the positive performance effect of product differentiation strategy adopted by foreign firms in China was weakened by the managerial political connections they developed with Chinese government officials and Henisz (2000) showed that in a dynamic business environment, strong connections between firms and local political institutions can have unintended adverse impacts on market strategy, as they could speed up the obsolescence process and reduce firm efficiency.

In sum, the study of non-market strategies (i.e., the integration between CPA and CSR, and their impact on firms' performances) is of fundamental importance to help firms survive and grow, mainly in challenging contexts such as developing countries (Shaffer and Hillman, 2000; Doh et. al, 2012 and Lawton et. al. 2014).

3. THEORETICAL BACKGROUND

What emerges from the literature review is that more integrated studies are needed on the interactions between nonmarket strategies and firm performances (Baron, 1995). In this scenario, our paper seeks to fill this gap by investigating how CPA and CSR strategies affect four different dimensions of firm performance.

Building on our discussion in Section 2, we consider a wider set of performance indicators to reflect the broader assessments of firms' social and economic success. Specifically, we identify four main categories of performance: economic, resource, reputation, and efficiency (Frynas *et al*., 2006; Hillman and Keim, 2001; Madsen and Rodgers, 2015; Mellahi *et al.,* 2016; Ramsey and

Bahia, 2013). Firms' economic performances are indicators that reflect the fulfilment of economic and financial goals by the firm and include both accounting based and market-based measures such as ROI, ROA, ROE, PM, EPS and stock price. Firms' resource performance refer to the degree to which firms have access to strategic resources (e.g. land, natural resources, water and infrastructure) and the right to exploit them. Firms' reputation performance refers to the firm legitimacy and brand recognition by the internal (e.g., employees or managers) and external stakeholders (e.g., customers, suppliers, local communities, NGOs). Finally, the efficiency refers to the all non-financial factors that may have an impact on performance and that have to do with the process management and firm organizational governance structure (e.g., how people coordinate their actions and use the resources within the organization) (Ramsey and Bahia, 2013).

Looking at CSR strategies, when studying their impact on firms' performance researches have mainly focus on one of two typologies of CSR, and did not consider them as a whole (e.g., Rathert, 2016). In this paper, we want to make an effort to overcome this limitation by considering a much wider range of CSR strategies. In particular, starting from the existing literature and the study of firm sustainability reports, we identify four main areas in which CSR activities are implemented: economic development; environment protection; human rights and education; and health and public services. Economic development refers to the CSR initiatives taken in order to economically develop the area where firm is investing. Classical example are actions aimed to eradicate poverty, to reduce unemployment, to create industrial clusters or to finance local start-ups. The environment protection embodies all activities that a firm could implement to protect the environment and natural resources or to reverse their degradation. Some typical examples are the introduction of cleaner technologies or the adoption of more stringent environmental regulations. The human rights and education category refers to actions implemented by firms to stimulate the social development of local community by raising human capital and the protection of human rights. Typical examples are training provided to firms' employees or local entrepreneurs, campaigns against racism and gender discrimination, projects for the inclusion of minorities, construction of new schools or kindergartens and provision of school supplies for low-income students. The fourth and last category is health and public services. This category involves activities aimed to improve communities' wealth being and

safety. It includes, for instance, the development of telecommunication, electricity, water or transportation systems, the construction of hospitals or the provision of vaccinations to low-income people.

Defining and measuring CPA strategies has posed substantial challenges for researchers. Indeed, CPA is highly context specific and varies depending on the country, sector and firm (Hillman et al., 2004; Shaffer and Hillman, 2000). In this paper, we follow the classification of Hillman and Hitt (1999) which provide three typologies of CPA strategies based on the three goods that they argue are exchanged in political markets, i.e., information, money and votes. These constructs are defined as information, financial incentives and, constituency building. The information strategy is the provision of sensitive information directly to political decision makers, and it is based on tactics such as lobbying, testifying before government bodies, and publishing technical reports. Financial incentives use money as a strategy for political involvement (e.g., bribery). Finally, constituency-building strategies target political decision makers indirectly through constituent support, e.g., by mobilizing employees for political actions such as voting (Hillman *et al*., 2004).

All above described performances and non-market strategies lead to the creation of our integrated conceptual framework displayed in Graph 1.

[Insert Graph 1 here]

Due to the complexity of the conceptual framework, this paper is meant to be explorative. For this reason, two research questions are formulated and state as follows.

RQ1. *Do non-market strategies result in improved firm performances?*

RQ2. *Which non-market strategy (CPA or CSR) is more strongly associated with improved firm performances?*

4. METHOD

4.1 Sample

Data to test our research questions are drawn from the World Bank Private Participation in Infrastructure (WB PPI) Projects database. This database contains a list of infrastructure projects in developing and emerging countries co-funded by both private and public sector. In particular, the minimum level of private participation considered in the database is 20 percent of project equity. For this study, we focus only on the projects in the electricity sector, in the concluded,

construction and operational status, made in sub-Saharan Africa from 2000 to 2014, for a total of 121 projects. The choice of one specific region is important in order the take into consideration specific regional effects; under this perspective, we decided to focus on sub-Saharan Africa, as it is one region that has received still limited attention from management and strategy community but that is increasingly attracting new investors. The time period has been limited to the most recent 15 years because, as better explained later, our dependent and independent variables have been built through content analysis on documents extracted from the Web, which availability is dramatically larger for the last fifteen years, especially to what concerns sub-Saharan Africa. The restrain to the electricity sector is necessary because strategies are generally sector specific, and firms operating in a specific sector have a limited set of non-market actions to cope with. Thus, considering only projects implemented in one sector guarantees to find the impact of strategies on performances, excluding sectorial mechanisms.

From these 121 projects, we identified all private firms involved, which led to the creation of a database of 186 observation where the unit of analysis is the couple project-firm. The sample has been further reduced, because we further filter for the firm sector. Indeed, strategies are contingent on only on the project sector but also on the firm one. For instance, on one hand, a bank that funds electricity infrastructure projects will probably try to promote policies, adjust prices on the markets, assist the country in the removing of external subsidies, help the country to design and finance programs or selectively accelerate specific projects over others. On the other hand, a construction or utility firm will probably have a more direct and operative involvement in the project, performing activities such as construction and management (Chomitz, 2009). Specifically, for this study we focus on firms in the supply chain of the electricity sector, which are, based on the Fortune 500 classification, those operating in the utilities, capital goods, conglomerate, construction and, technology hardware and equipment's sectors (description of sector characteristics are presented in Table A.1 in Appendix). This leads to the restriction to 112 project-firms couples (i.e., 95 projects and 89 firms).

Graph 2 displays some important characteristics of our sample. Namely, there is a peak of projects financed in 2012 and 2013. More than 40 percent of these projects have been implemented in the Central Africa, followed by the Southern Africa, which hosts more than 35 percent of the projects. In particular, South Africa accounts for 30 percent, Uganda for 10

percent and Kenya for 8 percent. Further, 81 projects, out of 95, are implemented by one private firm only. In particular, of these 81 projects, 66 are implemented by foreign firms and 15 by domestic ones. Most of these firms are African (38 percent), mainly from South Africa; followed by European (23 percent) and North American (11 percent). Finally, the firm sector distribution shows that 64 firms are utilities (70 percent), 9 firms rely to the capital good sector, 8 to construction s, 6 to conglomerates and 2 to technology hardware and equipment.

[Insert Graph 2 here]

4.2 Measurement of Performances and Strategies

For measuring firm non-market strategies and performances, we adopt a *dictionary-based content analysis* (DBCA) approach, which allows to measure phenomena with mixed nature of qualitative and quantitative aspects (Jung and Pompper, 2014; Milne and Adler, 1999). The DBCA approach is graphically presented in Table A.2 in Appendix. It consists of systematically screening a collection of relevant documents (i.e., sampling units) and extrapolating from them all evidences of the investigate topic. Specifically, documents are screened by units of content, which are a set of dictionaries containing words that describe the topic at stake (Kohlbacher, 2006). To do so, a software is adopted, which elaborates the documents based on the dictionaries and provides a numerical output, equals to frequency of appearance of each words of the dictionary in the documents, i.e., volumetric analysis (Vourvachis, 2007).

The sample units adopted for this study are a set of documents that explicitly disclose information about each couple project-firm from 2000 to 2016. These documents are sourced from the database LexisNexis and belong to three categories: news in English[59], industry reports[60] and, company reports[61]. These categories allow to catch the general public opinion; to have a

[59] *News (English Language).* The news sources comprehend magazines, journals and newsletters about business, legal and social topics with the specificity of being in the English language. Examples are Newsweek, Variety, and Library Journal.

[60] *Industry Report.* Industry report are market researchers and business intelligence providers, such as BBC Monitoring, Business Monitor International, Datamonitor-Industry Report, EIU, Euromonitor Sector Capsules, Global Insight, Hoover's Industry Snapshots, Integra Industry Reports, Market Guide Industry Aggregates Nelson's, Standard & Poor's, Worldwide Market Share, Worldscope.

[61] *Company Report. C*orporate annual reports and publications are the most widely distributed documents produced by companies. Listed companies usually publish a description of their strategy in the "Investors" section or a plan for

broader view of what is happening in a specific sector (e.g., what are key players involved, common political practises, potential issues and reasons for strategies change or dismissal) and; to catch internal company's dynamics, strategies and motivations behind the implementation of a project. In addition, to avoid endogeneity problems and mitigate potential common method bias problems, documents have been divided into two parts. All documents published from 2000 to 2016 have been used to measure non-market strategies, while performances have been measured only on documents published from the year of financial closure until 2016. In total, 5740 documents have been retrieved. For 8 couple no documents have been found, reducing our sample from 112 to 104 observations.

The content units used are keywords gathered in dictionaries. Keywords are defined as the most representative verbal item to describe the topics of interest, in this case strategies and performances. They can be any nouns, verbs, or adjectives that carries essential information in a written sentence that is clearly talking about the topic at stake. For each type of strategy and performance a dictionary has been built, passing through three stages. First, a preliminary version of the dictionaries has been created by means of the internationally validated keywords listed in the General Enquirer from Harvard database[62] and the existing literature on the topic. Then, these dictionaries have been validated by running a preliminary DBCA on a small group of documents that explicitly talk about the strategies and performances that we wanted to measure. Finally, dictionaries have been enriched by including neighbouring words that cluster around keywords contained in each dictionary. This process brought to the creation of 12 dictionaries, 4 for measuring performances and 7 for measuring strategies, where each dictionary corresponds to a new variable (the full content of the dictionaries is displayed in Tables A.3, A.4 and A.5 in Appendix).

After the documents download and the construction of dictionaries, the DBCA has been done for each dictionary and observation. First, it has been computed the frequency of each keyword the dictionary. It is equal to the number of times that each keyword appears in the documents,

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CSR development in the "Sustainability" section. Additionally, in this section are included also Stocks Report issued by financial authorities such as Standard & Poor's corporate descriptions or SEC filings.

[62] http://www.wjh.harvard.edu/~inquirer/ Accessed on 9th July 2016.

divided by the total number of words contained in the documents at the net of the stop words[63]. Then, the dictionary frequency has been computed, equals to the sum of the frequencies of all the keywords contained in the dictionary. Therefore, as DBCA is not able to catch the sign of the phenomenon (i.e., raise or decrease of performance or, implementation or non-implementation of strategies), the dictionary frequency is adjusted by a negative coefficient that takes into account the number of negations contained in the documents (i.e., not, doesn't, don't), which represents the probability that keywords are associated to a negative meaning[64].

Subsequently, in order to reduce the number of variables, a principal component analysis (PCA) has been run. Consequently, the three CPA strategies (information, financial incentives, constituency and building) have been condensed in a unique item factor (α=0.7) called *CPA*; and the four CSR strategies (environment, health & public services, economic development, human rights & education) in a unique item factor (α=0.8), called *CSR*.

Finally, when the DBCA does not reveal any results we consider that the company did not declare the adoption of any strategies or the raise of any performances, and we treat this information not as a missing data but as a zero. This information has been then taken into consideration in our analysis, thanks to the introduction of dummy variables to what concern the strategies and, by the adoption of a truncated model to what concern performances (for more details see Model section).

In conclusion, the DBCA let to the creation of 8 variables for 102 observations, which state as follow.

Perf_Resource, Perf_Reputation, Perf_Efficiency, Perf_Economic. These are continuous variables that measure the degree of increase of each performance. They are the dependent variables of our model.

[63] Stop Words are words as "a", "above" or "after" that merely represent sentence constructs, but do not bring any information to our analysis.

[64] The validity of this method has been then tested statistically with a T-test. In particular, we took a sub-sample of words and documents and assessed if the value of the dictionary frequency adjusted by the statistical negative coefficient is significantly different from the value of the dictionary frequency adjusted by the manual negative coefficient (i.e., manual check and counting of the number of times keyword is used negatively). T-test results show that there is not significance difference between the values calculated with statistical method and the values calculated manually, validating this approach for measuring the sign of the keywords.

CSR, CPA. These are continuous variables that measure the degree of adoption of each strategy. They are the independent variables of our model.

NoDeclared_CSR, NoDeclared_CPA. These are dummy variables equals to 1 if the strategy has not been declared, 0 otherwise.

4.3 Control Variables

As firm performances do not depend only from their own strategies, the model has been enriched with two categories of control variables: country and project level variables (note that we already partially control for firm size and firm sector during the sample selection phase[65]).

Country level control variables are gross domestic product (GDP) growth rate (Source: World Bank Development Indicators) and political stability (Source: World Bank Governance Indicators). The former measures the growth prospects of a country and proxies the health of its economy. The latter controls for the role of institutions in determining firms' performance, and ranges from -2.5 to 2.5. What we expect is that both raise firm performances. Thus, good perspective of economic growth and a stable political environment encourage a long-term orientation and reduce expropriation risks typical of all infrastructure investments (Levy and Spiller, 1994). It is also worth mentioning, these two variables have respectively 5 percent (GDP growth) and 6 percent (political stability) of missing data, further reducing our sample from 104 to 93 observations.

Project level variables control for the type of private participation and project function. The type of private participation is measured by two dummy variables: *Greenfield* and *Divestiture*. Both of them are equity solutions. The former indicates that the private company is involved in the construction of a new plant ex-novo. The latter indicates that a private company buys an equity stake in a state-owned enterprise through an asset sale, public offering, or mass privatization program. Our baseline is represented by non-equity solutions, i.e., management, lease and concession.

The electricity infrastructure can be used for different functions, namely generation, transmission and distribution of electricity, or a combination of them. In order to track these differences we introduce a dummy variable, called *NoCombination*, equals to 1 when the infrastructure have

[65] Firms have at least the 20 percent of infrastructure project equity, meaning they are big companies and; they are all operating in the sector of the supply chain of electricity.

only one function, 0 otherwise. The baseline are cases when infrastructure serves different functions at the same time (e.g., distribution and transmission or generation and transmission).

4.4 Model

In order to test our research questions, we specify the following model:

$$Perf_{ij} = \alpha 0 + \alpha 1\ Non\ Market\ Strategy_{ij} + \alpha 2\ No\ Declared\ Strategy\ rij + \lambda\ Zik + \varphi\ Dj + \varepsilon ij$$

Where i is the firm, j the project and k the country where the project is implemented. $Perf_{i,j}$ is our dependent variable measured in turn by economic, efficiency, reputation and resource performances. *Non Market Strategy* $_{i,j}$ is the independent variable, measured in turn by CSR and CPA strategies. *No Declared Strategy* is the dummy that tracks if strategies have been declared or not. $Z_{i,k}$ is the vector of country level control variables (i.e., GDP growth and political stability). $D_{i,j}$ is the vector of project level control variables (i.e., NoCombination, Greenfield and Divestiture) and, $\varepsilon_{i,j}$ is the i.i.d. disturbance term.

In order to take into consideration cases when a raise in performance has not been tracked by the DBCA, a Tobit model is adopted, left-truncated for all performance values equal to zero (Tobin, 1958).

4.6 Descriptive Statistics and Correlation Matrix

Table 1 shows descriptive statistics and correlation matrix of the variables of our model.

[Insert Table 1 here]

Political stability in average is quite low (-0.4) and varies from -2.1 to 1.5; this means that the sub-Saharan countries where these projects are implemented are on average not politically stable. However, these countries are economically growing with an average rate of 2 percent, even though there is a big difference between them, i.e. GDP growth varies from -7 to +7 percent. The majority of these projects are greenfield and dedicated only to one function (generation, transmission or distribution of electricity). The four types of performance are strongly and significantly correlated each other, and the same happens for the three different strategies. This confirms that disentangling the various performances and strategies is possible but difficult and, that potential overlapping could exists.

5. RESULTS

Tables 2, 3, 4 and 5 show results obtained with the Tobit estimator when we adopt as dependent variables respectively economic, resource, efficiency and reputation performances (for the sake

of synthesis, only results of marginal effects have been reported in the tables). Each table lists three models. In Model 1, we study the impact of CPA on firm performance. In Model 2 the impact of CSR.

The present section is organized as follows. Evidences coming from the control variables are commented on first. Then, marginal effects of the independent variables are described. Finally, a comparison between the results obtained with the different dimensions of performance and strategy is presented.

[Insert Table 2 here]

[Insert Table 3 here]

[Insert Table 4 here]

[Insert Table 5 here]

Unexpectedly, political stability does not impact any of our dimensions of performance. On the contrary, GDP growth has a significant and positive effect on all four dimensions, confirming that firms' performances do not depend only on firms' strategies but also on macroeconomic trends (Meyer *et al.,* 2008).

Looking at the project-level control variables, results show that the type of private participation matters. Specifically, in order to raise performance, firms have to engage in divestiture rather than in greenfield or non-equity investments. In other words, to gain reputation, efficiency, profitability and access to resources, firms have to the take over existing public electricity infrastructure. A possible explanation could be that greenfield investments tend to be very risky because they involve a high amount of initial capital and because are exposed to high expropriation risks, especially in developing and emerging countries, such as the sub-Saharan ones (Levy and Spiller, 1994; WB, 2013). In addition, even though non-equity solutions relive firms from expropriation risks and from large capital investments, they usually have a short-term horizon and rarely help firms to gain any competitive advantage or to conquer any strategic position (Mundhe, 2008). On the contrary, divestitures allow firms to have a long-term horizon, with full ownership rights, an initial limited capital investment and mitigated expropriation risks.

Always looking at the project level control variables, no evidences have been found on the impact of the project function. Been involved in the generation, transmission, distribution of electricity, or in a combination of them, does not affect firms' performance.

Looking at our independent variables, what emerges is that is fundamental for firms to declare their non-market strategies. Indeed, in all tables the two dummy variables NoDeclared_CPA and NoDeclared_CSR have always a negative and significant coefficient ($p<0.01$). This is more likely to be true when economic and reputation performances are taken into consideration.

Whenever non-market strategies are declared, they always have a positive and significant impact on performances, as showed by the CPA and CSR variables in Tables 2, 3, 4 and 5. However, in order to understand if a difference exists between these two typologies of non-market strategies, a T-test analysis has been done between the marginal effects of CPA and CSR, for each dimension of performance. Results of the T-test are presented in Table 6.

[Insert Table 6 here]

What emerges is that in order to raise economic performance firms that operate in sub-Saharan Africa have to leverage mainly on CPA strategies. Indeed, the magnitude of the impact of CPA strategy on economic performance (1.055 and $p<0.01$) is statistically different to the magnitude of CSR strategies and almost double (CSR: 0.778 and $p<0.01$). This is also true when our dependent variable is resource performance (CPA: 0.145 and $p<0.01$; CSR: 0.067 and $p<0.01$); showing that for firms aiming to gain access to strategic resources it is more effective to leverage on political actions rather than on social actions.

Efficiency performance do not strictly depends on a particular non-market strategy. Firms can raise their efficiency by implementing indistinctly CPA and CSR strategies (i.e., the difference between the coefficients of the marginal effects are not statistically significant).

Finally, looking at the reputation performance, an important difference emerges between CSR and CPA. Thus, the impact of CPA (magnitude of 1.322) is more than double than the impact of CSR (magnitude of 0.668) and their difference is statistically significant ($p<0.05$). A possible explanation is that for firms that invest in electricity infrastructure is more important to gain reputation with local politicians and officials than with local communities or NGOs. Thus, the final scope of these firms is to mitigate the risk of political extortion, which can quite high in sub-Saharan countries, to guarantee the profitability of their investment. For this reason, firms prefer to operate as political rather than as social actors (Levy and Spiller, 1994; Boddewyn and Doh, 2011).

6. DISCUSSION AND CONCLUSION

The goal of this paper is to investigate, in an integrated way, how firms' non-market strategies affect different types of firms' performances. In order to have a clearer and more finely-grained picture of the phenomenon, non-market strategies have been split into CPA and CSR and four different type of performances have been considered: economic performances, organizational efficiency, improved reputation and, access to strategic resources.

We used a sample of 93 firm-project pairs in electricity infrastructure financed in sub-Saharan Africa from 2000 to 2014 and firms are private investors involved in these projects that belong to the supply chain of electricity sector. First, we employed a dictionary-based content analysis to measure performances and strategies based on more than 5000 documents extracted from different sources. We then conducted an empirical analysis to test how the different strategies affect the different dimensions of performances.

Our overall finding is that, in developing countries, nonmarket strategies have a large impact on firms' performance. Namely, both types of non-market strategies are linked to all types of considered performances. However, except that for the dimension of organizational efficiency, the linkages between firms' performances are statistically more significant with CPA.

These results could also be used to source information about how firms (especially large) prioritize their stakeholder groups based on the type of performance they seek to achieve. Developing countries are generally affected by institutional voids that can raise the risk of expropriation and undermine the profitability of infrastructure investment (Khanna and Palepu, 1997; Levy and Spiller, 1994). For this reason, for firms that operate in these countries, in order to raise economic performance it is essential to improve their reputation with politicians and local officials, which become their principal stakeholders. This is also true when the scope of the firm is to get access to strategic resources, showing that in these contexts civil society is important but is not the main stakeholder. On the contrary, amelioration of organizational efficiency requires strategies that target a wider set of stakeholders, which range from employees, to managers, to competitors, to backward and forward linkages, to civil society and, to political class.

Our work, of course, has many limitations. The first is the risk of common method bias between dependent and independent variables. In order to mitigate this problem we have done the DBCA

on two different groups of documents (one for measuring performances and one for measuring strategies), which only partially overlap (for details see section Method). Additionally, the analysis is limited to a specific geographic region and to specific firm and project sectors. Potential future researches could be done by enlarging the analysis to other regions, starting from the developing ones such as Latin America or developing Asia, or to other firm and project sectors, in order to verify the generalizability of our results. In addition, it would be interesting to collect some primary data through interviews to illuminate the interpretation of our results.

Despite these limitations, this work brings important contribution to the literatures on non-market strategies and their relationship with firms' performances (Aggarwal, 2001; Baron, 1995; D'Aveni, 1994; Mellahi *et al.,* 2016) by providing an integrated and grained framework of analysis. In addition, the study has been developed in an unique context, sub-Saharan Africa, which has been little investigated. Not least, in this paper we adopt a methodology that so far has been limitedly used by the strategy and international business disciplines, i.e., the dictionary based content analysis, showing how it could represent a rigorous and standardized approach to measure complex phenomena, such as strategies and performance, which are high contingent to the firm's industry and country's context, which mechanisms are difficult to catch. Finally, this research could provide insights for managers of firms that invest in developing countries, as it could help to better arrange and prioritize CSR and CPA initiatives based on the particular performance objectives sought by the firm.

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Table 1. Correlation matrix and Descriptive Statistics.

	Variable	Obs	Mean	Std. Dev.	Min	Max	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1)	Perf_Resource	104	0.04	0.21	0.00	1.72	1												
(2)	Perf_Reputation	104	0.32	1.56	0.00	12.44	0.93*	1											
(3)	Perf_Efficiency	104	0.24	1.07	0.00	7.45	0.76*	0.88*	1										
(4)	Perf_Economic	104	0.17	1.03	0.00	9.60	0.91*	0.95*	0.71*	1									
(5)	NoDeclared_CSR	104	0.36	0.48	0.00	1.00	-0.07	-0.12	-0.12	-0.12	1								
(6)	NoDeclared_CPA	104	0.45	0.50	0.00	1.00	-0.11	-0.15	-0.16	-0.14	0.70*	1							
(7)	CSR	104	0.01	1.48	-0.76	8.45	0.55*	0.60*	0.54*	0.62*	-0.01	-0.09	1						
(8)	CPA	104	0.00	1.23	-0.58	7.87	0.55*	0.57*	0.45*	0.61*	-0.03	-0.01	0.85*	1					
(9)	Political_Stability	98	-0.40	0.66	-2.08	1.05	-0.31*	-0.22*	-0.13	-0.22*	-0.06	-0.13	-0.07	-0.19*	1				
(10)	GDP_Growth	99	2.00	2.09	-7.44	7.12	0.15	0.15	0.14	0.12	-0.09	0.08	-0.04	0.02	-0.20*	1			
(11)	Greenfields	104	0.84	0.37	0.00	1.00	-0.38*	-0.30*	-0.27*	-0.27*	0.06	0.09	-0.18*	-0.19*	0.39*	-0.08	1		
(12)	Divestiture	104	0.04	0.19	0.00	1.00	0.72*	0.53*	0.40*	0.48*	0.06	0.02	0.22*	0.26*	-0.45*	0.13	-0.45*	1	
(13)	NoCombination	104	0.91	0.28	0.00	1.00	-0.04	-0.07	-0.12	-0.05	0.02	-0.07	-0.12	-0.12	0.12	0.11	0.51*	0.06	1

* p<0.10

Table 2. Marginal Effects Tobit Model: Economic Performance.

	Model (1)		Model (2)	
VARIABLES	ME	Significance level	ME	Significance level
Political_Stability	-0.138	0.208	-0.121	0.441
	(0.109)		(0.157)	
GDP_Growth	0.073**	0.033	0.042	0.390
	(0.034)		(0.048)	
Greenfields	0.194	0.423	-0.007	0.983
	(0.241)		(0.342)	
Divestiture	0.988**	0.036	2.213***	0.001
	(0.464)		(0.639)	
NoCombination	-0.141	0.658	0.025	0.957
	(0.318)		(0.452)	
NoDeclared_CPA	-0.908***	0.000		
	(0.137)			
CPA	1.055***	0.000		
	(0.087)			
NoDeclared_CSR			-0.778***	0.000
			(0.204)	
CSR			0.483***	0.000
			(0.079)	
sigma	0.543***	0.000	0.788***	0.000
	(0.047)		(0.069)	
Observations	93		93	
No. of left-censored obs	28		28	
Log likelihood	-64.708		-90.384	
Chi-square	120.81		69.459	
Pseudo R2	0.483		0.276	

Dependent variable: Pef_Economic

Standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.10

Table 4. Marginal Effects Tobit Model: Efficiency Performance.

	Model (1)		Model (2)	
VARIABLES	ME	Significance level	ME	Significance level
Political_Stability	-0.012	0.946	0.026	0.888
	(0.180)		(0.181)	
GDP_Growth	0.100*	0.077	0.066	0.241
	(0.056)		(0.056)	
Greenfields	0.246	0.546	0.052	0.897
	(0.406)		(0.401)	
Divestiture	1.889**	0.018	1.986***	0.009
	(0.781)		(0.748)	
NoCombination	-0.084	0.875	0.131	0.805
	(0.534)		(0.529)	
NoDeclared_CPA	-0.851***	0.000		
	(0.225)			
CPA	0.353**	0.019		
	(0.147)			
NoDeclared_CSR			-0.596**	0.011
			(0.229)	
CSR			0.251***	0.008
			(0.092)	
sigma	0.918***	0.000	0.927***	0.000
	(0.079)		(0.080)	
Observations	93	93	93	93
No. of left-censored obs	25	25	25	25
Log likelihood	0.000	0.000	0.000	0.000
Chi-square	34.899	34.899	30.404	30.404
Pseudo R2	0.144	0.144	0.126	0.126

Dependent variable: Pef_Efficiency

Standard errors in parentheses.

*** p<0.01, ** p<0.05, * p<0.10

*** p<0.01, ** p<0.05, * p<0.10

Table 5. Marginal Effects Tobit Model: Reputation Performance.

	Model (1)		Model (2)	
VARIABLES	ME	Significance level	ME	Significance level
Political_Stability	-0.116	0.636	-0.073	0.800
	(0.244)		(0.288)	
GDP_Growth	0.148**	0.043	0.095	0.265
	(0.072)		(0.084)	
Greenfields	0.102	0.842	-0.236	0.688
	(0.511)		-0.586	
Divestiture	2.202**	0.032	3.655***	0.001
	(1.011)		(1.111)	
NoCombination	-0.397	0.546	-0.157	0.835
	(0.654)		(0.750)	
NoDeclared_CPA	-1.400***	0.000		
	(0.298)			
CPA	1.322***	0.000		
	(0.186)			
NoDeclared_CSR			-1.325***	0.001
			(0.375)	
CSR			0.668***	0.000
			(0.135)	
sigma	1.142***	0.000	1.335***	0.000
	(0.111)		(0.130)	
Observations	93	93	93	93
No. of left-censored obs	40	40	40	40
Log likelihood	0.000	0.000	0.000	0.000
Chi-square	73.906	73.906	57.418	57.418
Pseudo R2	0.268	0.268	0.208	0.208

Dependent variable: Pef_Reputation

Standard errors in parentheses.

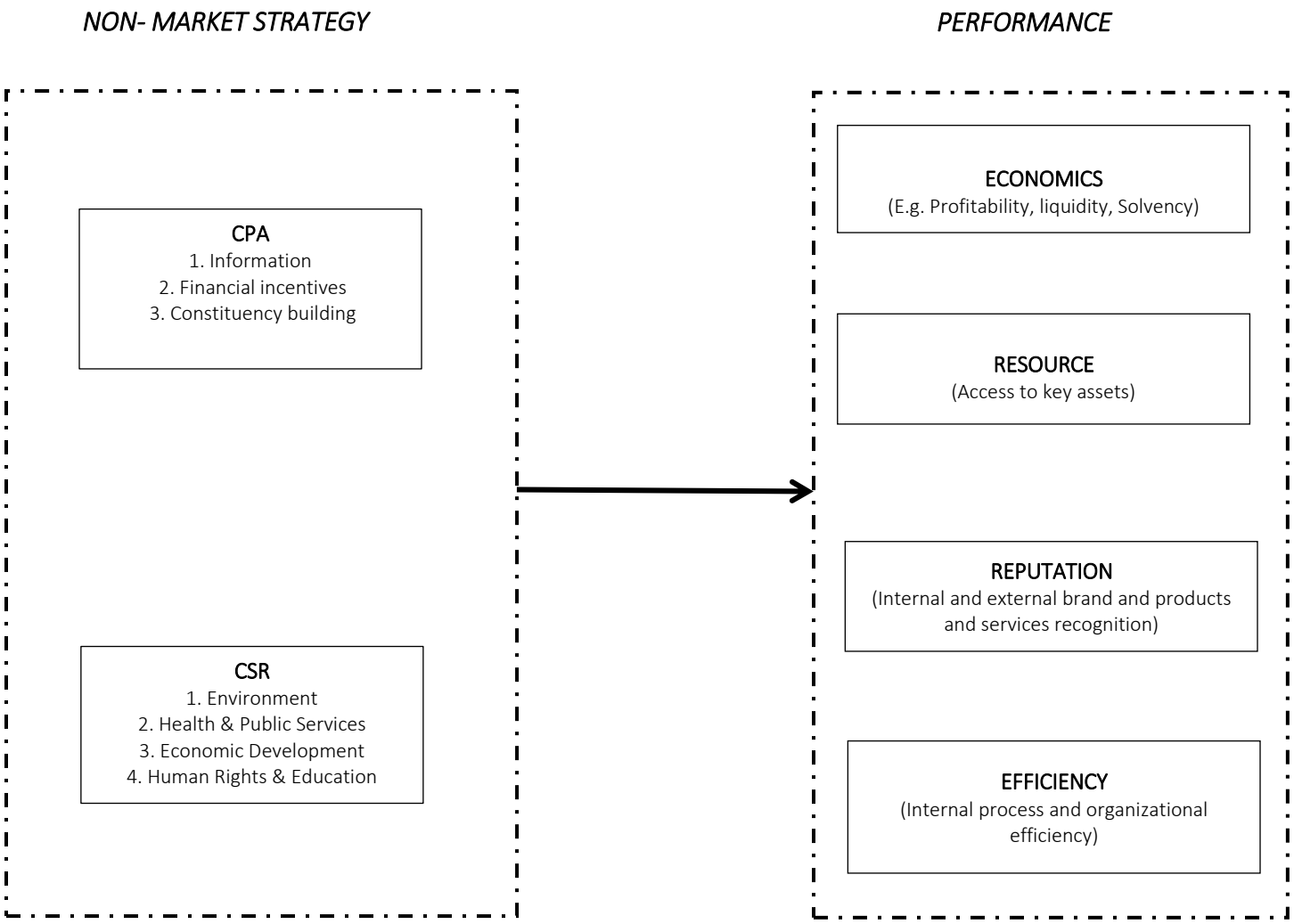
*** p<0.01, ** p<0.05, * p<0.10

Table 6. Estimates Comparison Analysis.

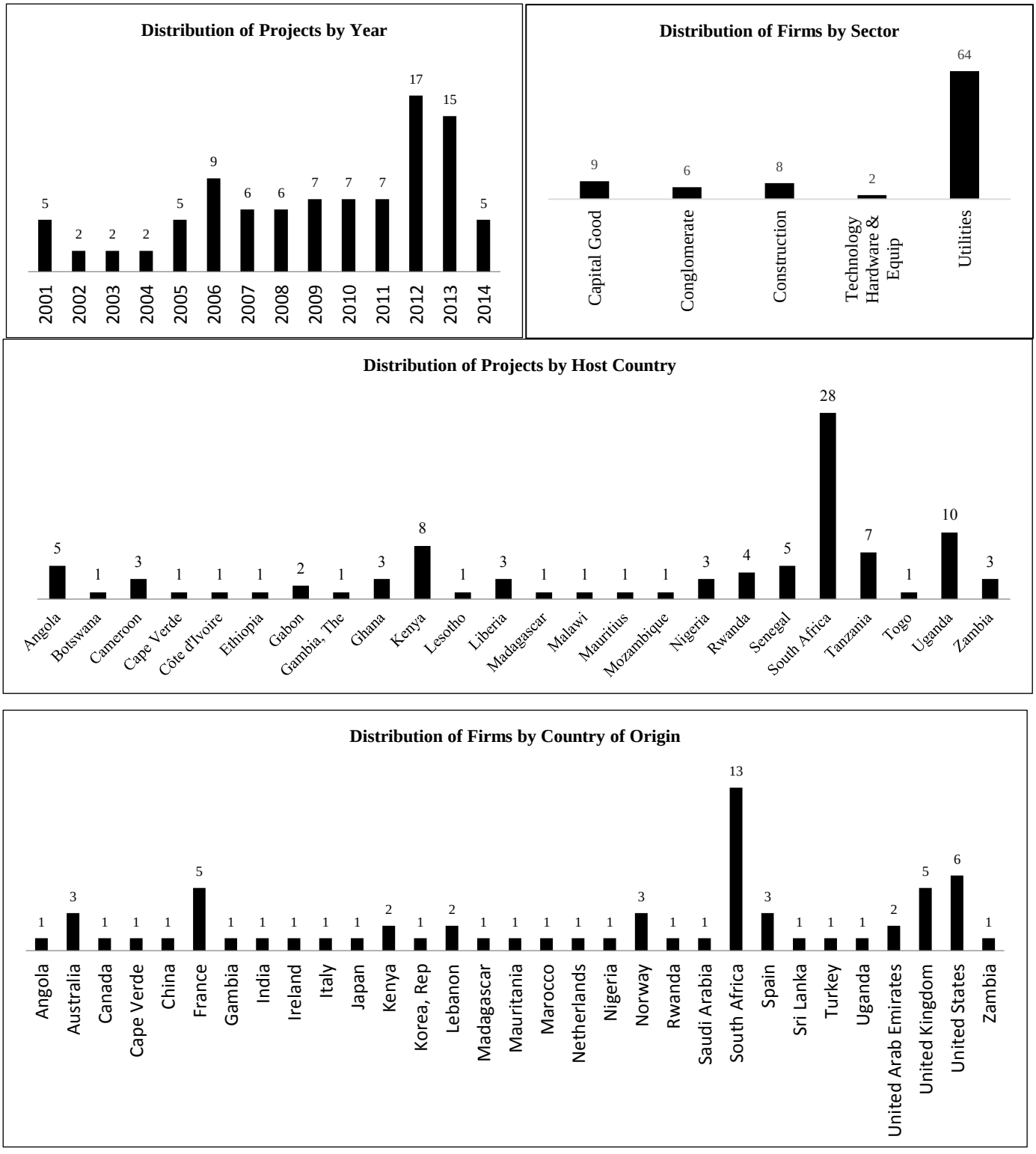
Variables	Economic Performance	Resource Performance	Efficiency Performance	Reputation Performance
CPA	1.055***	0.145***	0.353**	1.322***
	(0.087)	(0.018)	(0.147)	(0.186)
CSR	0.778***	0.067***	0.251***	0.668***
	(0.204)	(0.014)	(0.092)	(0.135)
Comparison between non-market strategies				
CPA = CSR	Rejected at p<0.01	Rejected at p<0.05	Not Rejected at a significance level	Rejected at p<0.05

Standard error in parentheses. *** p<0.01, ** p<0.05, * p<0.10.

Graph 1. Conceptual Framework



Graph 2. Sample Description



Source: Authors' calculation

APPENDIX

Table A.1. Description of the Sectors Considered for Our Analysis.

Sector	Description
Capital Goods	Companies that manufacture machinery used to create electrical equipment, aerospace and defence, engineering and construction projects
Conglomerates	Companies made up of a number of different companies that operate in diversified fields.
Construction	Companies involved in all kinds of infrastructure building (also energy plants)
Technology Hardware & Equipment	Companies related to the research, development and/or distribution of technologically based goods. This sector contains businesses revolving around the manufacturing of electronics, creation of hardware, computers or products relating to information technology
Utilities	Companies engaged in producing and delivering electric power, natural gas, water and other utility services, such as steam and cooled air

Source: Fortune 500 sector classification

Table A.2. Dictionary-Based Content Analysis Structure.

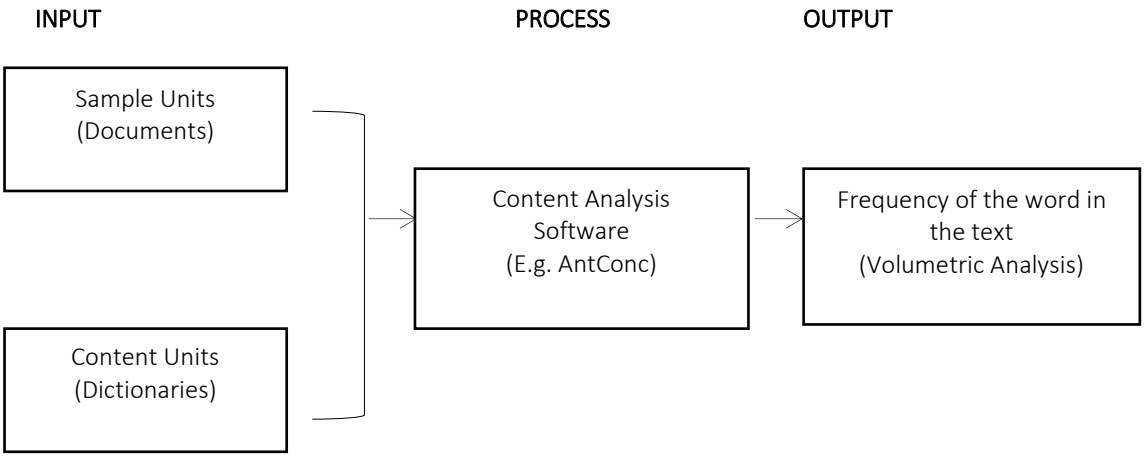


Table A.3. List of Keywords Used for the DBCA: Performances.

Typology of Performance	Keywords
Economic	Profitability, liquidity, solvency, sale, cash, inflow, credit, profit, pecuniary, outcome, monetary, viable, budgetary, benefit, payoff, debt, earn, share, revenue, margin, EBIT, ROA, ROE, bankruptcy, receivable, gross, ROI, FCFF, TIR, net, payback, loss
Efficiency	Efficiency, productivity, process, operation, capability, production, innovation, practice, lead-time, lean, time, waste, standardization, inventory, roles, coordination, teamwork, flexibility, planning, relationship, coefficients, scale, stationary, flow, smooth
Reputation	Reputation, brand, reputable, legitimacy, trustworthiness, trust, visibility, prestige, fame, scandal, defamation, calumny, admiration, loyalty, awareness, goodwill
Resource	Acquire, conquer, concession, license, reclamation, admission, acquisition, allowance, allotment, access, accordance, permission, compromise, authorization, approved

Source: Authors' analysis

Table A.4. List of Keywords Used for the DBCA: CPA Strategies.

Typology of CPA Strategy	Keywords
Incentive	Incentive, fund, warrant, sponsorship, patronizing, stake, bribe, angel, cash, bonus, grant, credit, loan, tax, lawsuit, persuading, monetary, accuracy, disbursement, encourage, accounting, law
Information	Marketing, intelligence, network, coded, security, interpretation, undisclosed, unpublished, cryptic, cognitive, unprinted, knowledge, information, events, understanding, CPA
Constituency Building	Patronage, election, alliance, reform, electorate, poll, ballot, referendum, taxpayer, ballotter, constituency, patria, campaign, convention, rally, politic, victory, partnership, armistice, pact, void, constituents, donor assisted, advocate, nominated, contributions, influence, lobbying

Source: Authors' analysis

Table A.5. List of Keywords Used for the DBCA: CSR Strategies.

Typology of CSR Strategy	Keywords
Environment	Sustainable, safety, eco, environment, emission, clean, pollution, degradation, disaster, ISO, green, CO2, nitrogen, carbon, waste, protocol, greenhouse, wood, forest, animal, ambient, climate, habitat, reserve, environ, ground, nature, ecology, ecosystem, organic, composting, hybrid, reuse, paperless, ozone, bio, deforestation, toxins, photovoltaic, land, water, soil, tree, biological, renewable
Economic	Employment, income, job, economic, exchange, import, export, career, informal, GNI, GDP, pension, aging, retirement, inflation, standard, donation, amortization, poverty, market, commerce, mortgage, homeless, entrepreneurial, start-up, incubator, industrial, urbanization, accelerator, growth, opportunity, industry, sector, tax, life, public, inclusive, transport, poor, quintile
Health & Public Service	Shortage, water, hospital, medicine, doctor, sanitation, health, nurse, birth, nativity, drug, feed, nutrition, slum, housing, tuberculosis, malnutrition, HIV, disease, mortality, drought, thirsty, hungry, livestock, starvation, road, mobile, sewer, internet, rail, transportation,, telephone, food, malaria, vaccination, hepatitis, distillation, blood, Ebola, sanitaria, diarrheal, survival, void, dengue, innocuous, virus, cephalic, infection, diagnosis, symptoms, serology, biomedical, mosquito, epidemic, illness, infrastructure, insurance
Human Rights & Education	Gender, female, girl, equality, emancipation, mother, widow, youth, feminine, masculine, masculist, sexist, misanthrope, harassment, persecution, molestation, unfairness, imparity, injustice, tolerance, mistreatment, marriage, parity, wife, black, reproductive, pregnant, fertility, gravidness, motherhood, baby, sexual, suffrage, daughter, matron, spouse, bride, condom, violation, moral, children, abortion, violence, daughter, matron, spouse, bride, workplace, discrimination, domestic, freedom, juries, equal, disparity, child, oppression, racism, migration, education, training, school, alphabetization, primary, secondary, literacy, illiterate, academic, campus, course, bachelor, textbook, graduate, instruction, intellectual, talent, learn, lecture, library, literalness, literary, copybook, laptop, notebook, tutor, teenager, assistant, teacher, professor, classmate, colleague, adolescent, pencil, pen, student, blackboard, book, uniform, elementary, kindergarten, erudition, discipline, scholarship, science, pedagogy, seminar, university, MBA, degree, deprive, marginalization, deny, ignorance, diaspora, study, rights, transgender, abuse, protection, teaching, learners, professional, college, curricul

Source: Authors' analysis