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Foreign Direct Investment Inflows and the Industrialization of African Countries

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Summary. — This paper examines the relationship between inward foreign direct investment (FDI) and the industrialization process in Africa. It uses panel data from 49 countries over the period of 1980–2009. The results indicate that FDI did not have a significant impact on the industrialization of these countries, while other variables, such as the size of the market, the financial sector, and international trade were important. This study concludes that the role of FDI in the transformation agenda, which is currently being discussed in Africa, should be carefully analyzed to maximize the impact of these capital inflows.

Key words — foreign direct investment, industrialization, panel data, Africa

1. INTRODUCTION

Over the last several decades, African countries have been exporting sizeable quantities and values of raw materials and commodities. They have generally failed, however, to diversify their international trade and their economy according to UNECA (2013): (i) the diversification indices published by the United Nations Conference for Trade and Development (UNCTAD) show that the structure of international trade for all African countries is highly concentrated, compared with the structure of the world average; (ii) the concentration of goods exports increased during the period from 1995 to 2012; and (iii) the share of primary products in exports is equal to at least 50% in three quarters of African countries, and 90% in one third of these countries.

It is recognized that this type of trade does not generate significant value added or enough jobs (UNECA, 2013) and that it increases countries' exposure to international exogenous shocks. One solution to the above-mentioned issues could be industrialization because it can contribute to the increase of household consumption, the demand for intermediate goods (Fleming, 1955; Rosenstein-Rodan, 1943), and change in the main drivers of economic growth. In this regard, African countries have been called upon by different organizations to move toward more diversified economies because such a move would reduce the volatility of economic growth and bring confidence to investors.

Yet, achieving this objective would require additional financial and technical resources. Financial resources may reach countries through the participation of national private investors, the involvement of foreign investors through foreign direct investment (FDI), or the mobilization of sizeable amounts of government resources, as many African countries are resource rich. Finding additional technical resources for initiating a "big push" would be more challenging, however, because private enterprises do not use the most advanced technologies. Therefore, attracting FDI could be a good policy option because foreign investors can bring financial assets as well as knowledge assets. In fact, previous studies have found that East Asian countries benefited extensively from FDI inflows during the transformation of their economies (Akkemik, 2009; Dahlman, 2009; Di Maio, 2009). Several studies, including Dong, Song, and Zhu (2011) and Borensztein, Gregorio, and Lee (1998), find that host countries could benefit from FDI through different channels, such as forward and backward linkages and technological transfers. Markusen and Venables (1999) and Rodríguez-Clare (1996) have shown theoretically that FDI could be a catalyst for industrialization.

Nonetheless, to our knowledge, there is a lack of econometric studies that analyze the impact of FDI on industrialization with a special attention to African countries; therefore, this paper attempts to fill this gap. Achieving this objective is important because FDI inflows to Africa have been increasing steadily, and it would be worth having a critical view on their impacts. Knowing whether policies that aim to attract FDI inflows were integrated in industrial policies would help to set a direction for a new generation of policies, providing that African countries desire to move in this direction. To this effect, the impact of FDI inflows on industrialization is analyzed with panel data from 49 countries observed during the period from 1980 to 2009.

The remainder of the paper is organized as follows: Section 2 explains how FDI inflows can induce industrialization and presents the relevant review of the literature; Section 3 presents stylized facts on industrialization in Africa; Section 4 presents an overview of the data used and addresses econometric and methodological issues; Section 5 presents the empirical results and their interpretation, while Section 6 concludes and summarizes the results from the study.

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2. REVIEW OF LITERATURE

It is worth noting that industrialization can be defined on the basis of national accounts indicators, and employment indicators. Industrialization can be defined as the increase of the value added of the manufacturing sector as a percentage of GDP (Chandra, 1992). In this regard, the realization of industrialization implies faster growth recorded in the manufacturing sector compared with other sectors. For Echaudemaison (2003), industrialization is observed through the increasing share of the secondary sector in terms of employment and GDP, and de-industrialization is observed when the tertiary sector gradually decreases in importance, accompanied by a crisis in traditional industries. De-industrialization is defined by UNIDO (2013) as the "long-term decline in manufacturing relative to other sectors," and is measured by the share of manufacturing employment in total employment.

From the above definitions, the analysis of the impact of FDI inflows on industrialization can be translated into two types of analyses: (i) one based on key components of the supply and use table (SUT) of the economy, a table that represents a set of national accounts transactions recorded by industries and products during a reference period (generally one year); and (ii) a second based on the impact on the sectorial distribution of jobs. If there is ongoing industrialization, the input matrix of the supply and use table, which records intermediate consumption of different industries by product, is expected to be modified, and the vector of production by industries is expected to be concomitantly altered. We consider this first set of effects as "direct impacts on industrialization." According to different studies, the phenomenon of technological transfer in the host economy can take place with the entry of FDI inflows in the manufacturing sector. The occurrence of this phenomenon would have an impact on the productivity of local firms in this sector and other related sectors, thus potentially impacting the industrialization process. We consider this type of effects as "indirect impacts on industrialization." While there can be an overlap between the two types of impacts, the main difference stems from the fact that direct impacts are mainly related to changes in goods or jobs, and indirect impacts result from the transfer of knowledge. Finally, in each country, there is a government that is supposed to play an important economic role by addressing market failures and improving its people's welfare; its actions and their impacts on FDI-led industrialization should be considered carefully. For example, in the domain of the training of the labor force, which supports the industrialization process, Rosenstein-Rodan (1943, p. 204) notes that: "*The automatism of laissez-faire never worked properly in this field.*" Another point is that the government can help reduce the magnitude of potential negative spillovers. The following sections therefore present theoretical and empirical studies on the direct and indirect impacts of FDI inflows on industrialization, and the role that can be played by the government in connection with these impacts.

(a) *Direct impacts of FDI inflows on industrialization*

Two major theoretical models have been developed by Rodríguez-Clare (1996) and Markusen and Venables (1999). The model developed by Markusen and Venables (1999) analyzes this impact in terms of the number of enterprises, and can be used to analyze the impact on industrialization defined in terms of GDP or value added, while the second model can be used for the employment-oriented definition of industrialization. The model developed by Rodríguez-Clare's (1996) analyzes the above-mentioned impact in terms of employment, specifically the "ratio of employment generated in upstream industries through the demand for specialized inputs to the labor force hired directly by the firm" (Rodríguez-Clare, 1996, p. 854). In general, these models' findings concur on the potential existence of positive spillovers under specific circumstances, which are presented in each model.

According to Markusen and Venables (1999), two effects emerge from the entry of MNCs: a competition effect and a linkage effect. The competition effect emerges from the fact that MNCs compete with domestic firms by producing substitutable products which can also be imported. The size of this effect increases with the size of the surplus of products present on the market, as compared to the initial supply of products without MNCs, and decreases with the productivity of the local firms. Linkage effects arise from connections with local suppliers. Specifically, if the intensity of usage of local inputs by multinational firms is lower compared with that of local firms, the exit of local firms producing final goods will be followed by the closure of domestic firms producing intermediate goods because the demand for the latter will decrease. On the contrary, if multinational firms use more local inputs than *local* firms producing the final good, the number of firms producing intermediate goods will increase due to *backward linkages*. In the case of an increase in the demand for intermediate goods, Markusen and Venables (1999) predict that new domestic firms will be created to satisfy the demand of multinational companies, which will contribute to the reduction of the price of intermediate goods (in a monopolistic competition). The decrease in the price of intermediate goods would be beneficial to domestic firms producing final goods because their cost of production would decrease, and other domestic firms in the industry of final goods will be able to break-even and make non negative profits through *forward linkages*. The emergence of these new firms would then be beneficial to other local firms through other rounds of backward and forward linkages.

Pertaining to the number of firms or the size of the industry, the study by Blomström (1986) of Mexican plant-level data aggregated at the four-digit level from 1965 and 1970 finds that an increasing presence of FDI in an industry increases the concentration of firms in an industry, meaning that less firms are present after the entry of the multinational.[1] Barrios, Görg, and Strobl (2005) provide similar results using Irish plant-level data observed during the period from 1972 to 2000. They find competition effects at the early stage of the entry of a multinational, but it appears that positive externalities resulting from this exogenous event outpace the initial negative effect at a later stage, so that the general impact on the number of local firms producing the same type of final good (compared with the multinational) is positive. The authors suggest that this result can be explained by the fact that local producers need some time to adjust and improve their capacities. It can then be assumed that the increase or decrease in the number of firms will result, respectively, in higher or lower manufacturing outputs (value added or employment), which will subsequently modify the matrix of intermediate consumptions, at least in the short-run. Although the primary objective of Liu (2002) was not to analyze the impact of FDI on industrialization in China, the dependent variable is the value added generated by firms, and as such, the study can be considered as a contribution to understanding this issue. The author finds a statistically significant and positive impact of the presence of FDI on the value added generated by firms in the Shenzhen Special Economic Zone. By

extrapolation, and according to the above definitions, these findings confirm the fact that FDI could foster industrialization.

Rodríguez-Clare (1996) analyzes the impact of FDI on the economy in terms of jobs creation, and the author's conclusions concur with those of Markusen and Venables (1999) on the necessity for the enterprise to use intensively local inputs toward the objective of creating more local jobs, thus increasing forward and backward linkages. Two key conditions to achieve this objective are analyzed by Rodríguez-Clare (1996): the good produced by the multinational firm should be highly complex because the production of the final good will require access to a variety of inputs, and there are high costs of communication between the host and home countries of FDI as they will increase the necessity of using local inputs. On the basis of a multisectoral model based on that of Rodríguez-Clare (1996), evidence of backward linkages is found by Alfaro and Rodríguez-Clare (2004) using firm-level data from Brazil (dating 1997–2000), Chile (dating 1987 to 1999), and Venezuela (dating 1995 to 1999). However, the authors find insignificant horizontal spillover effects due to the entry of multinational companies. Macroeconomics analyses on the impact of FDI inflows on employment have also been performed by Kang and Lee (2011) using panel data from OECD countries dating from 1970. The authors find a significant positive impact on industrialization – measured by the share of manufacturing in total employment or total value added – for inward FDI flows and a negative impact for outward FDI flows. On the contrary, Kaya (2010) finds that FDI inflows did not have a significant impact on industrialization in 64 developing countries during the period from 1980 to 2003.

(b) *Indirect impacts of FDI inflows on industrialization*

The indirect impacts of FDI inflows on industrialization emanate from technological transfers. Basically, technological transfers can increase the productivity, value added, and profit of an enterprise. In terms of the analytical framework developed by Markusen and Venables (1999), an increase in the profit of one local firm will attract more local investors to the activity until the profit of each firm is equal to zero, or equilibrium. Technological transfers can be realized through the acquisition or licensing of a technology or through labor mobility (see (Fosfuri, Motta, and Rønde (2001) and Glass and Saggi (2002) for theoretical explanations on spillovers due to the mobility of workers). The number of firms and jobs in the manufacturing sector and the volume of manufactured outputs (final and intermediate goods) would increase depending on the magnitude and the strength of backward and forward linkages for upstream and downstream firms, respectively, while horizontal spillovers will depend on the fluidity of the labor market and the capacity to acquire technologies.

In particular, on the one hand, upstream local firms, which supply intermediate goods to multinational and domestic firms, can have access to foreign technology from the MNC through the training of its staff, the recruitment of former staff of multinationals, or a direct licensing/acquisition of technology, i.e., vertical spillovers. All these factors would contribute to the production of final goods that meet standards set by the headquarters of the MNC. On the other hand, domestic firms in the multinational's industry would be able to increase their productivity by purchasing improved inputs from upstream firms, hiring former staff of multinationals, addressing inefficiency issues, or strengthening their research and development activities to copy the multinational's products or improve their own products by imitating multinationals (Görg & Greenaway, 2004, pp. 173–174). This situation would also contribute to the development of more competitive domestic firms operating in the industry of the multinational, i.e., horizontal spillovers. According to extensive reviews of the literature performed by Görg and Greenaway (2004), Smeets (2008), Harrison and Rodríguez-Clare (2010), Keller (2010), and the meta-analyses performed by Görg and Strobl (2001) and Wooster and Diebel (2010), however, empirical studies analyzing the existence of vertical and horizontal effects resulting from FDI inflows provide mixed results in terms of productivity.

Concerning labor mobility, Görg and Strobl (2005) examine firm-level panel data from Ghana observed during the period from 1991 to 1997 and find that domestic firms owned by former employees of multinationals exhibit greater productivity compared with other domestic firms. As noted by Smeets (2008), however, it is not clear if the same conclusion can be drawn for other employees. Thus, the analysis of the impact of labor mobility of former MNC's employees on the productivity of firms has so far been based on the analysis of the increase of wages in sectors with multinational companies. From this type of analysis, it can be concluded that domestic firms are more efficient and offer higher wages to attract skilled workers; however, the increase in wages can also be the advance indication of an increasing scarcity of skilled workers. The latter case is not automatically a positive development for actual and potential domestic firms if they have not increased their productivity, as their costs of production would increase and they would face challenges in recruiting labor.

Pertaining to vertical (productivity) spillovers, on the basis of firm-level data, the associated coefficient is found to be positive and significant by Sjöholm (1999) in Indonesia in 1980 and 1981, Javorcik (2004) in Lithuania during the period from 1996 to 2000, Liu (2008) in China during the period from 1995 to 1999, and Javorcik and Spatareanu (2008) in Romania during the period from 1998 to 2003. However, Javorcik (2004) and Javorcik and Spatareanu (2008) note that these positive vertical spillovers exist only when multinational firms have joint venture initiatives with local enterprises. The effect would be insignificant with 100% foreign capital according to the conclusions of Javorcik (2004) and Javorcik and Spatareanu (2008). While there seems to be a consensus concerning the potential existence of positive and statistically significant *backward* productivity spillovers due to FDI in specific contexts, *forward* productivity spillovers have not been widely confirmed. For instance, Bwalya (2006) in the case of 125 Zambian manufacturing firms during the period from 1993 to 1995 and Kugler (2006) with Colombian manufacturing plants observed between 1974 and 1998 did not find significant forward linkages. It is only recently that Xu and Sheng (2012) found positive forward linkages and negative backward linkages in the case of the Chinese manufacturing industry between 2000 and 2003. The authors explained the negative backward effects by Chinese policies, which encouraged the importation of raw materials and equipment by foreign firms, whereas positive forward effects emanate from the purchase of high-quality intermediate goods at low prices.

With reference to horizontal (productivity) spillovers, as for the other types of spillovers, results have also been mixed. According to the literature reviews by Harrison and Rodríguez-Clare (2010) and Keller (2010) prior to the study of Aitken and Harrison (1999) who find nonsignificant horizontal spillover effects for 4,000 Venezuelan industrial plants observed during the period from 1976 to 1989, positive

spillover effects of FDI were found in many of studies, including: Globerman (1979) in Canada with industry-level data observed in 1972, Blomström and Persson (1983) for the Mexican manufacturing industry observed in 1970, and Borensztein *et al.* (1998) in 69 developing countries observed during the period from 1970 to 1989 at the industry level. For Aitken and Harrison (1999), this result can be explained by the fact that foreign investors chose to invest in the most productive sectors. Nonsignificant effects are also found by Haddad and Harrison (1993), Girma, Greenway, and Wakelin (2001), Liu (2008) and Barbosa and Eiriz (2009) in Morocco, the United Kingdom, China, and Portugal, respectively. Haddad and Harrison (1993) and Girma *et al.* (2001) explain their results by domestic firms' low-level technical capabilities, (Barbosa & Eiriz, 2009) suggest that it is due to competition effects, while (Liu, 2008) associates it with the short-term effects of FDI that will become positive on the long-run. While a number of recent studies find positive and significant spillovers due to FDI on the basis of the variables proposed by Aitken and Harrison (1999), a few others, such as Konings (2001) studying transitional economies during the period from 1993 to 1997, Hu and Jefferson (2002) examining Chinese firm-level data from 1995 to 1999, Waldkirch and Ofosu (2010) studying Ghanaian firms observed during the period from 1992 to 1998, and Xu and Sheng (2012) find negative horizontal spillovers. Their main explanation is that competition effects are sizeable compared with technological transfer.

(c) *Government: spurring positive impacts of FDI inflows on industrialization*

One key element emerges from the above literature: FDI inflows are not always a blessing for host countries. Maximizing their positive impacts depends on several different factors: the existence of competition effects, multinationals' reliance on local inputs, and the mobility and existence of a skilled workforce, to name a few. Ignoring these factors can result in job destruction and the decline of social welfare. In this regard, the government may intervene to limit negative outcomes resulting from the entry of FDI. As such, industrial policies would be and have been essential in many countries, particularly in Asian countries that have benefited from FDI inflows. Essentially, these policies should aim at reducing the exit rate of domestic firms from the market, supporting domestic firms to catch up to MNCs, stimulating vertical linkages, and attracting the right categories of FDI inflows. While many economists can criticize government interventions, we are of the view of Bjorvatn and Coniglio (2012), who state that: "*Clearly, the presence of government failure is not by itself a justification for reduced government intervention*." Thus, the efficiency of government interventions should be improved.

(i) *Attracting the "best" categories of FDI inflows*

In general, theoretical models explaining industrialization assume that either there is local market for the final product, as in studies by Murphy, Shleifer, and Vishny (1989a, 1989b), Rodríguez-Clare (1996), and Markusen and Venables (1999), or that industrialization is export-led (Trindade, 2005). It is less likely that resource-seeking FDI inflows, compared with market-seeking FDI, contribute directly to a country's industrialization unless the country processes raw resources prior to exporting them. To increase a country's attractiveness to the "best" foreign investors for industrialization, the government should improve the business environment by unlocking institutional bottlenecks, ensuring political stability, providing infrastructure, and training the potential labor force. Additionally, the government should ensure access to a market.[2] According to Dahlman (2009), the Chinese authorities made extensive use of FDI targeting strategies with the following elements: the establishment of special economic zones to provide access to advanced technology and world-class inputs, the construction or availability of efficient transport and service infrastructures, and access to a large market. Singapore's government also utilized FDI targeting strategies. Pertaining to the business environment, as Da Rin and Hellman (2002) find that large banks can play a catalytic role for industrialization through the allocation of credits to a critical mass of firms, the government could be expected to create a strong legal framework that encourages the establishment of large banks, including foreign subsidiaries, in support of its efforts to move the industrialization agenda forward. This initiative would then contribute to the "optimal" allocation of credit to firms, particularly local firms in the manufacturing sector that is under development with the support of the government. The financial sector was essential for Japanese firms, according to Odagiri and Goto (1996). Improving the business environment in general and having a strong financial sector would help decrease firms' entry costs, and according to Markusen and Venables (1999), the entry costs are essential when using FDI as catalyzer of industrialization.

(ii) *Reducing the exit rate of domestic firms from the market*

According to Markusen and Venables's (1999) model, some domestic firms in the MNC's sector will exit from the market as some of them will record negative profits due to lower sales (competition effects) and sizeable fixed costs. The productivity of domestic firms would therefore deteriorate, and the government can be expected to intervene to address this issue. Fixed costs could be reduced through access to loans from large banks at competitive rates,[3] or through direct government interventions in other domains such as transport, education, investment coordination, and research and development (R&D).

The proposed direct role of the government in the industrialization process, with appropriate policies, can be dated back to (Rosenstein-Rodan, 1943) and the theory of "Big Push Industrialization." Rosenstein-Rodan (1943) asserts that the government should be involved in training the labor force and coordinating investment projects. Coordinating investment projects aims at developing a set of complementary industries that sustain demand and provide a market for firms, while training is perceived as a public good because trained workers are not obliged to remain at one firm. Through this coordination exercise, firms would be more profitable or less unprofitable.

Murphy *et al.* (1989b), who initially formalized the theory of the Big Push industrialization, propose a stronger role for the government: (i) to provide subsidies to firms to sustain the industrialization process; (ii) to build infrastructure that is required for increasing the productivity of the private sector (power station, roads, railroads, airports, seaports, etc.); and (iii) to step in by unlocking capital constraints and reducing the uncertainty or risk, as the size of the projects and the time required to accomplish them can reduce private sector participation. These actions would help decrease production costs (fixed and variable).

While Bjorvatn and Coniglio (2012) generally agree with Murphy *et al.* (1989b) on the possible government interventions listed above, the authors also propose the establishment of state-owned enterprises (SOEs) as a means of supporting

development of the private sector through aggregate demand. Such actions are expected to be followed by government retraction after a stronger manufacturing base has been developed (Bjorvatn & Coniglio, 2012). These types of actions can help domestic firms to survive after the entry of an MNC. According to the results of Bjorvatn and Coniglio (2012), who analyze the role of the government in the industrialization process, developing countries would need government interventions, such as those mentioned above, because failures of coordination are generally important, whereas developed countries would need modest interventions.

For instance, according to Dahlman (2009), results from the Chinese and Indian manufacturing sectors can be explained by the implementation of the following policies: infant industry protection, direct state ownership, selective credit allocation, favorable tax treatment, tariff and nontariff protection, FDI targeting, local content requirement, intellectual property laws, government procurement for domestic firms, and the promotion of large domestic firms. Rodrik (1996) and Rodrik, Grossman, and Norman (1995) estimate that East Asian countries widely utilized all the above-mentioned policies and, according to (Di Maio, 2009, p. 126), the implementation of these policies was time-bound.

(iii) *Supporting domestic firms to catch up MNCs and stimulating vertical linkages*

According to the empirical study of Barrios *et al.* (2005) in Ireland, the entry of MNCs results in the net exit of domestic firms from the market in the short-term, and a slow adaptation of domestic firms to competition from MNCs that resulted in the net entry of domestic firms in the long-run. This conclusion is plausible because firms internationalize their activities only when they have a specific advantage compared with local firms, and they are able to keep their comparative advantage during a limited time period. Due to the competition effect, local firms are expected to increase their productivity, an objective that can only be achieved by having access to more advanced technologies or technical capabilities. In this regard, in addition to the above-mentioned industrial policies, innovation policies implemented by the government would be critical. According to the World Bank (2010), innovation policies can be defined as policies that seek to insure the dissemination and use of "technologies or practices which are new to a given society" (World Bank, 2010, p. 4). To foster the development of national capabilities, these innovation policies should aim to: strengthen the education system so that graduates have key skills and capabilities for innovation; stimulate research and development activities as well as knowledge sharing; improve the business environment by encouraging competition and strengthening the legal framework; and support innovators (World Bank, 2010). Several generalized facts can be drawn from the Asian experience to support an active government role in fostering the productivity of local firms and encouraging different spillover effects through education and R&D.

Concerning education and training, the Chinese government invested heavily in its education system, has approximately 40% of its student in engineering and sciences (Dahlman, 2009, p. 313), has many tertiary-level students abroad,[4] and constantly provides training for its actual labor force in the manufacturing sector as well as the rural population coming to cities. In Japan, practical education programs (engineering, accounting, commerce, business administration) were implemented at the expense of purely scientific programs (Odagiri & Goto, 1996, p. 261). Similarly, the Taiwanese and South Korean governments invested massively in education (Di Maio, 2009, p. 117).

Pertaining to R&D activities and knowledge sharing, we can cite the following cases, among others: (i) the establishment of the Industrial Technology Research Institute (ITRI) in Taiwan in 1973 to acquire and disseminate foreign advanced technologies among Taiwan's firms; (ii) in South Korea, the funding of private R&D activities with special public funds and the provision of advantageous fiscal packages related to the acquisition of the foreign advanced technologies (subsidies for the transfer costs of patent rights and tax exemptions on income from technological consulting and for foreign engineers) (Di Maio, 2009, pp. 112–113); and (iii) in China, the Spark Program and the Torch Program to disseminate rural and high technologies, respectively, as well as the 15-year Science and Technology Plan with public expenditures for R&D, which was announced in 2005 (Dahlman, 2009, p. 323). Finally, local content requirements have been also used to strengthen backward linkages and foster the transfer of technologies in China with training requirements.

To conclude this section, the magnitude and sign of the direct and indirect impacts of FDI on industrialization are not easy to predict; however, based on the above literature, one can draw the following conclusions: FDI inflows are not always beneficial for receiving countries, and the government and the financial sector can play important roles during the industrialization process. This paper therefore attempts to shed some light on the impact of FDI on industrialization in African countries by taking stock of the above-mentioned factors.

3. GENERAL FACTS ON INDUSTRIALIZATION IN AFRICA

According to regional statistics, industrialization has not really taken place in Africa as an entire continent. The share of value added of the manufacturing sector decreased at an average rate of 5.68% in Africa over the period from 1980 to 2009, while in Asia, this share increased at an average rate of approximately 8% over the same period (see Figure 1). This situation is also reflected in the evolution and positioning of the diversification indices of African countries compared with developing countries in Asia and the Americas.[5] The international trade of African countries has been less diversified than that of Asian and American developing countries (see Figure 2), and did not change significantly during the period from 1995 to 2013.

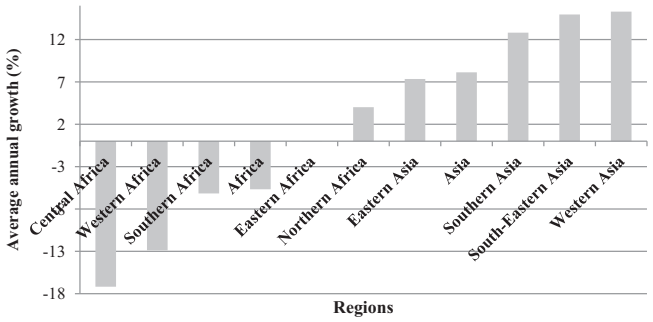

Figure 1. *Average annual rate of change in the shares of the value added of the manufacturing sector in Africa and Asia from 1980 to 2009.*[10] *Source: Authors' calculation based on data from the United Nations Statistics Division (UNSD).*

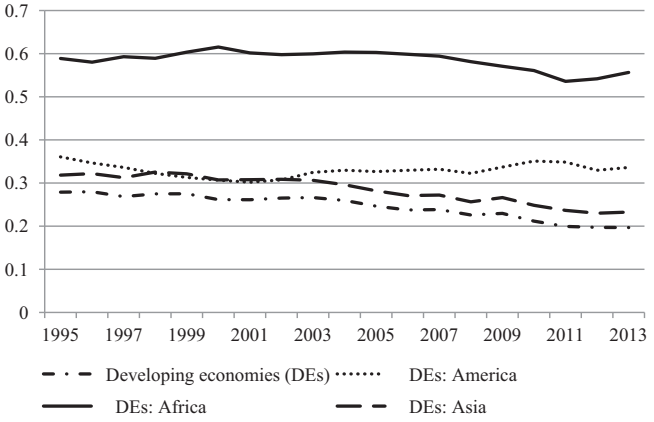

Figure 2. *Evolution of diversification indices in selected regions. Source: Authors' representation based on data from the United Nations Conference on Trade and Development (UNCTAD).*

An analysis of African sub-regions shows that it is only in Eastern and Northern Africa where efforts have been made to stabilize manufacturing output. At the same time, Asia and its sub-regions have seen their manufacturing sectors grow at a minimum of 7.34% on average during the period of study (Cf. Figure 1 and see Appendix Table 5). [6] Table 1 presents the evolution of the shares of the value added of the manufacturing sector by decade. Central Africa and Western Africa stand out as the worst performing regions in terms of industrialization due to ongoing de-industrialization.

These shifts in manufacturing output were accompanied by changes in other sectors. In Western Africa, the share of agriculture, hunting, forestry, and fishing industries increased from an average of 28.1% from 1980 to 1989 to 31.9% from 2000 to 2009. The share of activities in mining and utilities industry of Central Africa jumped from an average of 31.4% recorded from 1980 to 1989 to 46.9% from 2000 to 2009. Transport, storage, and communication activities increased mostly in Southern Africa, with their shares standing at 9.4% from 2000 to 2009, compared with an average of 6.4% recorded from 1980 to 1989.

At the regional level, the small size of the manufacturing sector in GDP is also reflected in the number of jobs in the manufacturing sector. Moreover, according to ILO estimates (KLM, 8th edition), the share of employment in the manufacturing sector in Sub-Saharan Africa was well below 9% during the last 20 years, far from the world average. It is only in North Africa that the share of employment in the industrial sector has been close to the world average, but there has not been a drastic increase of jobs in the industrial sector (See Figure 3).

Therefore, on the basis of UNIDO's definition of de-indus trialization/industrialization, which is based on employment indicators, African countries did not industrialize. National account data, however, which are the basis of the definitions of industrialization provided by Chandra (1992) and Echaudemaison (2003), suggest that there was a de-industrialization of African countries. This would mean that a constant share of the employed active population in the manufacturing sector produced less manufactured products and was thus less productive.

4. SPECIFICATION OF THE MODEL, ECONOMETRIC METHODS, AND DATA ISSUES

(a) *Variables*

(i) *Dependent variable*

The objective of our analysis is to assess the impact of inward FDI on the industrialization process in Africa. Two indicators may be used to measure industrialization according to Chandra (1992), Echaudemaison (2003), and UNIDO (2013): the value added of the manufacturing sector as a percentage of the GDP (constant prices), and the share of employment in the manufacturing sector in total employment. Dodzin and Vamvakidis (2004) and Kang and Lee (2011) use the value added of the manufacturing sector as a percentage of GDP (at constant prices), while Kaya (2010) and Kang and Lee (2011) use the share of employment in the manufacturing sector. Because of limited data availability of disaggregated employment data for African countries during the period of study, we will focus the analysis on the above-mentioned national account aggregate as the dependent variable and will report results with employment data for information purposes only.

(ii) *Explanatory variables*

The level of household income and market size are essential elements of the big push industrialization theory (Murphy *et al.* 1989a, 1989b). Different studies, including those of Rowthorn and Ramaswamy (1997, 1999) Kaya (2010), Kang and Lee (2011), and Dong *et al.* (2011), find that this variable has a positive impact on industrialization. These studies mainly use GDP per capita as a proxy for the level of income. To use data that are free of exchange rate fluctuations, to represent the potential real purchasing power of households and to reduce the issue of heteroskedasticity, the logarithm of the average real GDP per capita at purchasing power parity (PPP) in 2005 constant prices (GDPCAP), is used.

Table 1. *Evolution of the shares of value added of the manufacturing sector (in %)*

Regions/years	1980–1989	1990–1999	2000–2009
Africa	12.82	12.22	11.41
Eastern Africa	9.77	10.02	9.77
Central Africa	10.15	7.32	6.85
Northern Africa	10.18	11.10	10.99
Southern Africa	20.38	18.74	17.94
Western Africa	8.22	7.72	6.20

Source: Authors' calculation based on data from the United Nations Statistics Division (UNSD).

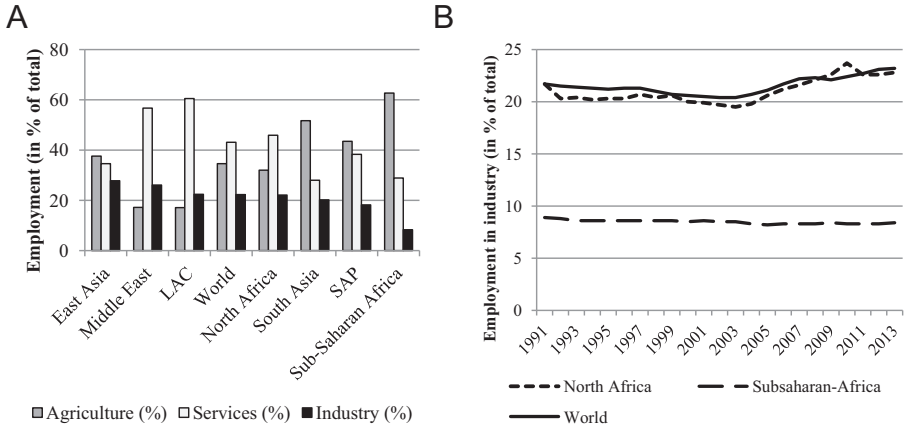

Figure 3. *Employment by sector (as % of total employment). (A) Structure of employment by sector. (B) Employment in the industrial sector, 1991–2013. Notes: Acronyms: LAC = Latin America and the Caribbean; SAP: South-East Asia and the Pacific. Sources: Authors' calculation based on data from the International Labor Organization (ILO), KILM 8th edition.*

One element of the big push industrialization proposed by Murphy *et al.* (1989b) and Rosenstein-Rodan (1943) is summarized in this statement: "*[. . .] simultaneous investment by many firms can become profitable even when each loses money investing in isolation*" (Murphy *et al.*, 1989b, p. 1016). These simultaneous investments are expected to increase the aggregate demand through income and the size of the market for all firms. Moreover, authors such as Rowthorn and Ramaswamy (1997), Kang and Lee (2011) and Kaya (2010) find a positive impact of investment on industrialization for both OECD countries and developing countries. Rowthorn and Ramaswamy (1997) explain this by the fact that investments generate a demand for manufactured products, while Kaya (2010) suggests that returns from domestic investments are more likely to be reinvested in the home country. On the basis of the above elements, the impact of investment is likely to be positive, and investment will be represented by the gross fixed capital formation (INV) in percentage of GDP at current prices.

According to the general facts of the African region, countries appear to have de-industrialized as the value added of the manufacturing sector as a percentage of GDP decreased. The literature on de-industrialization highlights two main factors that can explain this phenomenon: the level of income and international trade. Concerning income levels, there may be a positive correlation between the level of income and industrialization, which however becomes negative when the level of income reaches a certain point. This is known as the inverted-U theory of industrialization, an assumption based on Engle's Law. Therefore, de-industrialization would be a natural process hand-in-hand with development. It is assumed that as the level of income increases, there is a shift in consumption patterns from nonprocessed goods to manufactured goods (industrialization), and from manufactured goods to services (de-industrialization). Evidence of this assumption is found by Rowthorn and Ramaswamy (1997) and Kang and Lee (2011) in OECD countries, while Kaya (2010) finds some significant results in the case of developing countries. The existence of this relationship has been tested by considering the impact of the square of GDP per capita, with a predicted negative impact. To reduce potential heteroskedasticity issues, we use the square of the logarithm of GDP per capita (GDPCAP2). International trade can be an explanatory factor for industrialization: according to Rowthorn and Ramaswamy (1999), the trade surplus in manufactured goods is positively correlated to domestic manufacturing output and employment and can help finance a trade deficit in nonmanufactured goods. Moreover, Rowthorn and Ramaswamy (1997) find that imports have a negative impact on industrialization, and Kaya (2010) finds that the impact of low technology exports on industrialization is positive. On the basis of these studies, we include exports (EXP) and imports (IMP) as a percentage of GDP at current prices. The predicted signs of these variables are unknown as on the one hand, international trade statistics show that African countries export mainly commodities and import sizeable quantities of manufactured goods, including means of production, and on the other hand, exports and imports can be channels of technological spillovers, which can increase productivity and thus stimulate industrialization. Business activities in international markets increase enterprises' exposure to more advanced technologies or goods and allow firms to acquire technologies or imitate goods (Keller, 2010), as in the cases of China and India (Dahlman, 2009).

Because the expansion (contraction) of a sector corresponds to the contraction (expansion) of other sectors, the value added of the agricultural sector in percentage of GDP is included (AGRI). To include this variable, we have modified the model estimated by Kang and Lee (2011), who use the size of the service sector in OECD countries when analyzing de-industrialization and the emergence of the service sector. In fact, the present study analyzes African countries with significant contributions by the agricultural sector in some cases, and development is also about moving from low-wage activities (agriculture, in this situation) to higher wage activities, such as jobs in manufacturing. It is worth noting that the size of the service sector could also have been considered in conjunction with the variable AGRI; however, considering those two variables in an econometric model is likely to create multi-collinearity issues.

The variable FDI corresponds to net total foreign direct investment inflows as a percentage of GDP (both variables in current prices) as suggested in Kang and Lee (2011) and Kaya (2010). This variable has some limitations because it integrates manufacturing and resource-seeking FDI inflows while this study is mainly concerned with the manufacturing sector. Unfortunately, data presenting the sectoral breakdown of FDI inflows received by African countries are not always available and cannot be used in a robust analysis.

(b) *Econometric methods*

The basic model is presented below:

$$INDU_{it} = \alpha X_{it} + \beta FDI_{it} + \varepsilon_{it} + region$$

where the matrix X_{it} is made up of the following variables: GDPCAP, GDPCAP2, INV, EXP, IMP, and AGRI. The variable INDU represents the level of industrialization, or the value added of the manufacturing sector as a percentage of GDP (at constant prices), ε_{it} represents the residual, and *region* stands for the dummy variables of the regions because they are at different levels.

Autocorrelation and heteroskedasticity tests performed on the basis of fixed effects and random effects models revealed that it was necessary to use the feasible generalized least squares method (FGLS) to estimate the coefficients (Greene, 2012; Pirotte, 2011). Because the form of autocorrelation is not known accurately, common AR (1) and panel-specific AR (1) are tested.

Based on the results from other studies related to the impact of FDI, we consider for robustness checking the role of the financial sector, the role of the government, and analyses by sub-period.

A causality test on panel data was performed to check the potential existence of reverse causality, here, INDU being caused by FDI (a determinant of FDI). On the basis of the Dumitrescu–Hurlin causality test (Dumitrescu & Hurlin, 2012), the absence of causality in this direction could not be rejected.

The literature review stresses the role of the public and financial sectors during many countries' industrialization processes. Government interventions are represented by sub-components of the economic freedom index produced by the Fraser Institute (Gwartney, Lawson, & Hall, 2012) as follows: government enterprises and investment (GOV), freedom to trade internationally (INT), and regulation (REG). Economic freedom indices range between zero and 10, with zero indicating the highest level of government intervention. According to Gwartney *et al.* (2012), GOV represents the importance of state-owned enterprises in the economy, INT measures the magnitude of trade restriction barriers (tariff and nontariff barriers), and REG measures the freedom to enter into a market. The role of the financial sector will be represented by its size (money supply as a percentage of GDP, M2). The analyses by sub-period are justified by the fact that when analyzing the same set of African countries over the period from 1980 to 2009, Gui-Diby (2014) finds that the impact of FDI on the economic growth is positive during the period from 1995 to 2009 and negative before this period.

(c) *Data*

The dataset comprises yearly observations of 47 African countries during the period from 1980 to 2009. For each variable, approximately 1,410 observations will be used. Net FDI inflows were extracted from the United Nations Conference for Trade and Development (UNCTAD) database. Data on the value added of the manufacturing, service and agricultural sectors, gross fixed capital formation, exports, and imports as a percentage of GDP were obtained from the United Nations Statistics Division (UNSD) database for main national accounts aggregates. The shares of value added of the manufacturing and agricultural sectors were computed on the basis of country national accounts data estimated in US dollars at constant 2005 prices. The manufacturing sector corresponds to economic activities under the Section D of the International Standard Industrial Classification of All Economic Activities, Rev.3.1 (ISIC Rev 3.1). [7] The Penn world tables were used for PPP GDP per capita at 2005 constant prices. The share of employment in the manufacturing sector is extracted from the International Labor Organization (ILO) KILM database, 8th edition. Data on government interventions and the standard deviation of prices were obtained from the Fraser Institute (Gwartney *et al.*, 2012), while data on the size of the financial sector were extracted from the World Development Indicators (WDI) database of the World Bank.

Table 2 presents the correlation matrix between all the variables and shows that: (i) the correlation between the level of industrialization and the level of income seems to be weak; (ii) FDI inflows and national investments are negatively correlated to the level of industrialization; and (iii) the roles played by the government and the financial sector in the evolution of industrialization appear to be modest.

Table 3 presents descriptive statistics for all the variables. On the basis of this table and by computing the coefficients of variation, it can be concluded that the variable FDI is the most scattered variable.

5. EMPIRICAL RESULTS

Table 4 presents the results of regressions performed with all the countries during the period from 1980 to 2009. Columns

Table 2. *Correlation matrix between all the variables of the study*

Variables	INDU	AGRI	FDI	INV	EXP	IMP	M2	GDPCAP	GDPCAP2	GOV	REGU	INT
INDU	1.00											
AGRI	−0.12	1.00										
FDI	−0.16	−0.09	1.00									
INV	−0.10	−0.38	0.37	1.00								
EXP	0.05	−0.62	0.35	0.29	1.00							
IMP	0.07	−0.39	0.32	0.60	0.54	1.00						
M2	0.16	−0.45	0.00	0.22	0.19	0.27	1.00					
GDPCAP	0.06	−0.76	0.12	0.32	0.64	0.27	0.47	1.00				
GDPCAP2	0.05	−0.75	0.12	0.32	0.65	0.27	0.47	0.99	1.00			
GOV	0.19	−0.13	0.06	0.15	0.06	0.06	0.07	0.07	0.08	1.00		
REG	0.30	0.02	−0.03	0.22	−0.19	0.13	0.17	0.08	0.08	0.15	1.00	
INT	0.07	0.06	0.11	0.16	0.00	0.17	0.12	0.07	0.07	0.09	0.53	1.00

Sources: Authors' calculations based on various data sources.

Table 3. *Descriptive statistics*

Variables	Average	Standard deviation	Minimum	Maximum	Observations
INDU	0.098	0.064	0.001	0.411	1470
AGRI	0.265	0.156	0.017	0.945	1470
FDI	0.029	0.074	−0.654	0.905	1470
INV	20.171	10.798	2.000	107.846	1470
IMP	40.729	25.269	1.868	178.714	1470
EXP	30.163	19.450	1.360	121.78	1470
GDPCAP	7.174	0.920	4.764	10.191	1470
GDPCAP2	52.306	13.874	22.697	103.862	1470
GOV	3.714	3.047	0	10	482
REG	5.771	1.043	2.8	8.2	482
INT	5.44	1.498	0	8.8	468

Sources: Authors' calculations based on various data sources.

(1) and (2) present results of the analysis performed by only considering the control variables and incorporating a common AR (1) and 49 panel-specific AR (1), respectively, in (1) and (2). Columns (3) and (4) incorporate the variable FDI inflows with the above-mentioned forms of autocorrelation. Results in columns (5) through (9) present robustness analyses with the inclusion of: the financial sector and government intervention. Results by sub-period are reported in Appendix Table 6.

First, the size of the market or the level of income has a positive impact on industrialization because the sign of the coefficient associated with GDP per capita is positive. On the basis of the negative sign of the square of GDP per capita, it can be concluded that this impact increases up to a certain level and later decreases. Table 4 indicates that the turning point of de-industrialization is between $381 (column 2) and $472 (column 3). These turning-point results are well below those found by Rowthorn and Ramaswamy (1999) who find a turning point equal to at least $8,276, do not match with the inverted U-theory on industrialization/de-industrialization which establishes the link between the size of the manufacturing sector and the level of income, and thus, should be mainly interpreted as an indication of an early decrease of the size of the manufacturing sector. With these relatively low levels of income and industrialization, we should expect an expansion of the manufacturing sector with the level of income level. Rodrik (2014)'s analyses concur with the fact that the contraction of the manufacturing sector occurs earlier in African countries than in advanced economies. This situation is likely linked to the implementation of structural adjustment programs in African countries, to the occurrence of a natural resource curse phenomenon over the period from 1980 to 1994, and to the increase of imports of manufactured final products (which constitute more than 50% of the total imports) over the period from 1995 to 2009 *(See the results on the impact of investments, exports, and imports)*. In fact, according to Stein (1992), sub-Saharan African countries faced an industrial crisis due to the significant expansion of the industrial sector led by import substitution industries and remarkably ineffective government interventions in productive activities. As a result, Stein (1992) argues that the World Bank/IMF prescriptions that were implemented through structural adjustment programs contributed to the destruction of the manufacturing base of African countries. Stein (1992, p.85) resumes these prescriptions in resource shifts "*from industry to agriculture, from public to private ownership, import-substituting to export industries, and final good production to raw material processing [...].*" As a consequence, manufacturing activities began declining or stopped increasing when African countries did not have high income levels and an entrepreneurial class could not emerge. In the case of African countries, results related to the inverted-U assumption show that de-industrialization occurred at an early stage, not at an advanced stage of development as suggested by this theory and results from advanced economies. For UNCTAD (2007) structural adjustment programs contributed to the restoration of macroeconomic stability but did not contribute to structural transformation and diversification, and thus to industrialization.

Second, the impact of the variable investment seems to be significant and negative for all the estimated equations while the impact of trade variables differs by sub-period (see Appendix Table 6). Further, the coefficients associated with exports are negative during the period from 1980 to 1994 while those associated with imports are positive during the same period. The impact of imports on industrialization is negative during the period from 1995 to 2009. The negative coefficients observed with the variable investments do not match those found by Kang and Lee (2011), and Rowthorn and Ramaswamy (1997, 1999).

Coefficients associated with exports and trade balance match those found by Kang and Lee (2011) but differ from those found by Rowthorn and Ramaswamy (1997, 1999), who use the trade of manufactured goods in advanced economies. The results of this study should be interpreted bearing in mind the following elements in the African context: exports have been largely made up of commodities (highly concentrated) while imports have been highly diversified, with a significant share of final good products.

The results on the negative impact of investment and exports can be explained by the natural resource endowment and its economic consequences, and by the sets of economic policies implemented by a sizeable number of African countries. These results correspond also to the occurrence of a natural resource curse phenomenon (for details, see Frankel, 2012) during the period from 1980 to 1994, but this phenomenon seems to have stopped over the period from 1995 to 2009. In terms of natural resource endowments, resource rich countries naturally expanded their natural resource-related activities and were able to display a trade surplus. Thus, an explanation of the negative impact of investments and exports can be found in the fact that, according to Corden and Neary (1982) and Botta (2010), a boom in a specific sector (including the natural resources sector) can contribute to de-industrialization by attracting more resources

Table 4. *Results of regressions with annual data (1980–2009) – dependent variable: INDU*

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
GDP per capita	0.05663***	0.05552***	0.05948***	0.05728***	0.05941***	0.05084***	0.12160***	0.11882***	0.12679***
	(4.47)	(4.75)	(4.64)	(4.98)	(4.34)	(4.15)	(4.7)	(5.17)	(6.11)
Investment	−0.00008**	−0.00011**	−0.00009**	−0.00012**	−0.00012**	−0.00017***	−0.00026*	−0.00029**	−0.00042***
	(−2.02)	(−2.51)	(−1.98)	(−2.75)	(−2.28)	(−3.65)	(−1.73)	(−2.21)	(−3.11)
Exports	−3.14E−05	−3.53E−05	−3.19E−05	−4.49E−05	−6.11E−05	−0.00009**	−0.00053***	−0.00040***	−0.00056***
	(−0.82)	(−1.03)	(−0.81)	(−1.35)	(−1.30)	(−2.55)	(−4.31)	(−3.29)	(−4.43)
Imports	0.00006**	4.92E−05	0.00006**	5.26E−05	7.24E−05	6.10E−05	0.00034***	0.00023**	0.00030***
	(2.23)	(1.67)	(2.2)	(1.87)	(1.86)	(1.8)	(2.99)	(2.12)	(2.81)
Agriculture	−0.09626***	−0.07811***	−0.09529***	−0.08052***	−0.08237***	−0.07206***	−0.12759***	−0.14370***	−0.15401***
	(−12.57)	(−11.67)	(−12.36)	(−11.92)	(−9.74)	(−9.47)	(−7.25)	(−8.81)	(−9.59)
GDPCAP2	−0.00461***	−0.00467***	−0.00483***	−0.00476***	−0.00478***	−0.00416***	−0.00916***	−0.00900***	−0.00930***
	(−5.33)	(−5.82)	(−5.54)	(−6.03)	(−5.15)	(−5.10)	(−5.16)	(−5.58)	(−6.45)
FDI			−0.0011	−0.00073	−0.00518	−0.00551	−0.00308	−0.00262	0.00589
			(−0.34)	(−0.20)	(−1.34)	(−1.36)	(−0.17)	(0.18)	(0.39)
Size financial sector (M2)					0.00009***	3.71E−05	0.00017**	0.00009	0.00008
					(2.74)	(1.19)	(2.34)	(1.15)	(1.09)
Government investment/SOE							0.0042		
							(1.57)		
Freedom to enter in market (REG)								−0.00004	
								(−0.05)	
Free internat. Trade (INT)									0.00044
									−0.83
Constant	−0.064	−0.0512	−0.0729	−0.0612	−0.0798	−0.0496	0.26883***	−0.24524***	−0.28020***
	(−1.35)	(−1.18)	(−1.52)	(−1.43)	(−1.55)	(−1.06)	(−2.83)	(−2.94)	(−3.70)
Dummy region	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	1,468	1,468	1,468	1,468	1,344	1,344	470	467	447
Type of autocorrelation	Common	Panel-specific	Common	Panel-specific	Common	Panel-specific	Common	Common	Common
Turning point	$465	$381	$472	$410	$500	$451	$763	$735	$913

*, **, and *** refer to 10%, 5%, and 1% significance levels, respectively. Figures in brackets represent *z*-statistics.

and investments than the manufacturing sector.[8] Thus, the attractiveness of the booming sector can be the root of a "role model" phenomenon (Brautigam, 2009; Crespo & Fontoura, 2007) because the first enterprises in the sector provide information on failures and successes to other potential investors. Recorded successes in the booming sector could have dragged more local investments in the sector (Lin, 2011). For instance, natural resources have been playing increasingly important economic roles in African countries: in 1980, 50% of African countries had natural resource rents equal at least to 6.3% of GDP, while in 2009, rents were equivalent to 10.5% of GDP. Further, it is shown by Mendoza (2010) that international trade determines the learning curve of local firms; the complexity of exports products would push local firm to learn more abroad. Concerning the economic policies, it should be stressed that African countries have been highly vulnerable to international shocks, which is among the factors that forced these countries to use the IMF and World Bank's financial facilities and later their structural adjustment programs.

Pertaining to imports, the positive impact during the period from 1980 to 1994 can be explained by the importation of capital or intermediate goods in the framework of import-substitution industrialization strategies (Stein, 1992). The negative impact over the second period can be the result of the combination of two factors: deindustrialization due to structural adjustment programs that left countries with weak human capacities and a small industrial base (Stein, 1992; UNECA, 2011), and the import structure, which is highly diversified and thus may not have contributed to creating conditions for the emergence of a strong manufacturing sector. It is even argued that: "*[. . .] the growing dependence on imports eroded the weak industrial base of most African countries*" (UNECA, 2011, p. 15). Nevertheless, it must be noted that other conditions, such as a poor business environment, also contribute to the nondevelopment of a strong manufacturing base (Rodrik, 2014). To conclude on the sign of the coefficients of trade variables, the likelihood of their sign is also confirmed by the negative sign of the coefficient associated with the variable *trade balance* (See Appendix Table 7); meaning that improving the trade balance would also have a negative impact on industrialization, as in Kang and Lee (2011).

Robustness analyses show that, apart from trade variables, coefficients associated with other control variables seem to consistently retain the same sign and, to a certain extent, the same level of significance. Moreover, evidence of the (positive) importance of the financial sector for industrialization is found in many equations, while there is no evidence of the impact of government intervention on industrialization. The results concerning the impact of the financial sector are similar to those presented by Da Rin and Hellman (2002). However, variables related to the intervention of governments do not have a significant impact on industrialization.

Finally, concerning the impact of FDI, most of the analyses show nonsignificant results, and if it did exist, the results reported in columns (5) and (7) in Appendix Table 6 show that this impact would have been negative. While the analysis of employment is not worth considering, its results show that the impact of FDI is not significant. Two reasons for the failure of FDI to contribute to industrialization could be government's ineffective interventions (see results in Table 4), and governments' failure to establish the enabling environment to attract FDI inflows in the manufacturing sector. Firstly, according to results in Table 4, government's interventions did not have a significant impact on industrialization. This result might be due to low variability of the explanatory variables. However, some studies, such as Stein (1992), and UNECA (2011), suggest that some African countries implemented unfriendly measures for industrialization such as: monopoly restrictions such as exclusive exploration rights, sole supplier contracts, and domestic-market exclusivity. These measures could not help strengthen the backward, forward, or horizontal linkages that could have been established between MNCs and local enterprises. The evaluations, on the limited FDI spillover effects in African countries, which have been performed by Stein (1992) and UNECA (2011), are also supported by UNIDO (2013). Moreover, UNCTAD (2007) argues that governments failed to design and implement sound industrial policies because they lacked technical and analytical capabilities, and there was a poor management of public goods and services. Therefore, the negative impact of government interventions cannot be completely ruled out, even though it might be during specific periods which probably vary significantly according to the country. Secondly, pertaining to the government's failure to establish the required enabling environment, countries' business environment and governance indicators published by the World Bank show that African countries are lagging in this domain, thus impeding the development of a strong private sector, particularly the manufacturing sector.[9] For example, empirical studies performed by Asiedu (2006), Alsan, Bloom, and Canning (2006), and Gui-Diby (2012) confirm that countries with sizeable endowments of natural resources received larger FDI inflows. Furthermore, according to Alsan *et al.* (2006), foreign investors have been attracted to developing countries with high levels of income (mainly resource rich countries) and high levels of corruption. UNIDO (2013, p. 116) also stresses that resource rich countries with low governance did not change structurally.

6. CONCLUSIONS AND SUMMARY

This paper examines the impact of FDI inflows on industrialization in African countries during the period of 1980–2009. The results indicate that FDI inflows did not have a significant impact on countries' industrialization. Our results remain robust to the insertion and alteration of different variables such as the size of the financial sector, trade balance, and government interventions and to analyses performed by sub-period. This suggests that one reason for the failure of FDI to contribute to industrialization could be governments' failure to establish an enabling environment for FDI to catalyze industrialization. This situation resulted in hosting resource-seeking FDI inflows and the existence of weak or no links between MNCs and local enterprises.

These results should galvanize African policy makers to rethink the design of national policies aimed at attracting FDI, as well as to design and implement sound industrial policies and streamline both types of policies in the same framework. The coherence of both sets of policies will be critical to optimize the benefits that these countries and their people will be able to receive.

It should be noted, however, that this paper is limited due to the unavailability of reliable data on employment in the manufacturing sector and of FDI breakdowns by sector for the time period considered. Moreover, by analyzing 47 countries

in the same dataset, it is assumed that all countries intended to develop their countries through industrialization, which may not have actually been the case. Considering the country of origin of FDI inflows could have also provided interesting features, still this subject might be considered for future research.

NOTES

1. These results correspond to the ones of Caves (1976) who finds, on the basis of Australian and Canadian data in the 1960s, that the entry of multinational companies into an industry can increase competition in that industry, reduce the profits of domestic firms in the same industry, and lead to a reshuffle of firms with the entry and exit of domestic firms.

2. See Mucchielli and Mayer (2005), Asiedu (2006), and Asiedu and Lien (2011) for literature reviews concerning the determinants of FDI inflows.

3. See Da Rin and Hellman (2002) on the role of banks in industrialization.

4. Dahlman (2009, p. 313): In 2005, more than 16% of the 2.7 million students studying abroad were from China, excluding Hong Kong.

5. The diversification index, which is a modified Finger–Kreinin index, provides a measure of the difference between the structure of exports by product of a given country and the structure of world exports of the world. An index value close to one indicates a large difference from the world average.

6. The average annual growth rate is obtained by computing the mean of the growth rate of the share of the sector in the GDP computed at the sub-regional level. Sub-regional and regional aggregate national accounts data have been computed by the United Nations Statistics Division (UNSD).

7. See http://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=17 for details (accessed on December 20, 2014).

8. In this paper, while it seems that there is a Dutch-Disease in these countries during specific periods, we are not addressing this issue as it would have required analyzing another set of variables.

9. See http://www.doingbusiness.org/.

10. See the country classification in Appendix Table 5.

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APPENDIX 1

Table 5. *List of countries by sub-region*

Region 1 = Eastern Africa	Region 2 = Central Africa	Region 3 = Northern Africa	Region 4 = Southern Africa	Region 5 = Western Africa
Burundi	Angola	Algeria	Botswana	Benin
Comoros	Cameroon	Egypt	Lesotho	Burkina Faso
Djibouti	Central African Republic	Morocco	Namibia	Cape Verde
Ethiopia	Chad	Sudan	Swaziland	Cote d'Ivoire
Kenya	Congo	Tunisia		Gambia
Madagascar	Dem. Rep. of Congo			Ghana
Malawi	Equatorial Guinea			Guinea
Mauritius	Gabon			Guinea-Bissau
Mozambique	Sao Tome and Principe			Liberia
Rwanda				Mali
Seychelles				Mauritania
Tanzania				Niger
Uganda				Nigeria
Zambia				Senegal
Zimbabwe				Sierra Leone
				Togo

APPENDIX 2

Table 6. *Results of regressions by sub-period with annual data – Dependent variable: INDU*

Periods	Period 1: 1980–1994					Period 2: 1995–2009				
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
GDP per capita	0.0979***	0.0863***	0.0604***	0.0562***	0.0274***	0.0923***	0.1640***	0.1359***	0.1445***	0.1223***
	(6.50)	(6.16)	(5.83)	(4.79)	(2.69)	(3.92)	(6.47)	(5.76)	(5.95)	(6.26)
Investment	−0.0003***	−0.0042***	−0.0006***	−0.0002**	−0.0005***	−0.0001	−0.0001	−5.20E−06	−0.0002	−0.0002*
	(−3.83)	(−4.18)	(−7.30)	(−2.41)	(−7.20)	(−0.99)	(−1.28)	(−0.53)	(−1.54)	(−1.72)
Exports	−0.0003**	−0.0002***	−0.0004***	−0.0003	−0.0003***	−0.0001	8.16e−06	1.10e−06	−8.10e−06	5.00e−06
	(−2.16)	(−2.60)	(−6.14)	(−0.39)	(−5.49)	(−1.08)	(0.09)	(0.14)	(0.86)	(0.64)
Imports	0.0002***	0.0003***	0.0002***	0.0001**	0.0002***	−0.0001*	−0.0002***	−0.0002***	−0.0002***	−0.0002***
	(3.75)	(3.80)	(4.26)	(2.46)	(4.33)	(−1.91)	(−3.01)	(−3.50)	(−2.88)	(−3.90)
Agriculture	−0.1095***	−0.1086***	−0.0735***	−0.0520***	−0.0616***	−0.1134***	−0.1163***	−0.0892***	−0.0924***	−0.0869***
	(−12.22)	(−10.74)	(−8.33)	(−5.24)	(−7.71)	(−9.75)	(−9.42)	(−8.37)	(−7.12)	(−7.70)
GDPCAP2	−0.0068***	−0.0062***	−0.0045***	−0.0044***	−0.0025***	−0.0071***	−0.0120***	−0.0100***	−0.0108***	−0.0096***
	(−6.56)	(−6.34)	(−6.49)	(−5.37)	(−3.74)	(−4.35)	(−6.86)	(−6.07)	(−6.63)	(−7.38)
Region1				0.0132***	0.0133***				0.0122***	0.0070**
				(5.12)	(5.99)				(3.05)	(2.22)
Region2				−0.0151***	−0.0172***				−0.006	−0.0067*
				(−5.00)	(−6.44)				(−1.30)	(−1.85)
Region3				0.0635***	0.0483***				0.0289***	0.0313***
				(9.75)	(6.48)				(4.71)	(5)
Region4				0.0532***	0.0544***				0.0374***	0.0388***
				−5.01	−4.15				−4.12	−4.62
FDI	−0.0028	−0.0024	−0.0103	−0.0072	−0.0142**	−0.0064	−0.0205*	−0.0141	−0.0238*	−0.0178
	(−0.67)	(−0.41)	(−1.32)	(−1.34)	(−2.53)	(−0.57)	(−1.73)	(−1.21)	(−1.93)	(−1.43)
Size of financial sector (M2)		0.0002***	0.0005***	0.0001**	0.0003***		0.0003***	0.0002***	0.0002***	0.0001*
		(3.42)	(7.82)	(2.26)	(5.06)		(5.98)	(4.4)	(3.23)	(1.69)
Constant	−0.2240***	−0.1782***	−0.0927	−0.0848*	0.0251	−0.1660*	−0.4284***	−0.3299***	−0.3626*	−0.2577***
	(−4.03)	(−3.47)	(−2.35)	(−1.95)	(0.63)	(−1.96)	(−4.67)	(−3.92)	(−3.98)	(−3.50)
Number of observations	733	703	703	703	703	735	641	641	703	641
Type of autocorrelation	Common	Common	Panel-specific	Common	Panel-specific	Common	Common	Panel-specific	Common	Panel-specific

*, **, and *** refer respectively to 10%, 5%, and 1% significance level. Figures in brackets represent *z*-statistics (Normal density).

APPENDIX 3

Table 7. *Results of regressions with trade balance – Dependent variable: INDU*

Periods	1980–2009		1980–1994		1995–2009	
Variables	(1)	(2)	(3)	(4)	(5)	(6)
GDP per capita	0.0592***	0.0521***	0.1478***	0.1249***	0.0497***	0.0397***
	(4.33)	(4.15)	(6.08)	(6.36)	(4.36)	(3.70)
Investment	−0.0001**	−0.0002***	−0.0002*	−0.0002**	−0.0001**	−0.0004***
	(−2.27)	(−4.20)	(−1.89)	(−2.37)	(−1.86)	(−6.46)
Trade balance	−0.0001*	−0.0001***	0.0001**	0.0002	−0.0001**	−0.0002***
	(−1.91)	(−2.70)	(2.46)	(2.89)	(−2.25)	(−3.88)
Agriculture	−0.0828***	−0.0744***	−0.0886***	−0.0803***	−0.0541***	−0.0639***
	(−9.95)	(−9.87)	(−7.05)	(−7.37)	(−5.49)	(−7.52)
GDPCAP2	−0.0048***	−0.0043***	−0.0111***	−0.0098**	−0.0039***	−0.0034***
	(−5.16)	(−5.05)	(−6.78)	(−7.51)	(−4.89)	(−4.79)
FDI	−0.005	−0.006	−0.0252**	−0.0186	−0.0061	−0.0137***
	(−1.31)	(−1.57)	(−1.99)	(−1.44)	(−2.53)	(−2.77)
Size of financial sector (M2)	0.0001***	4.20e−05	0.0002***	0.0001*	7.50e−05	0.0002***
	(2.74)	(1.36)	(3.24)	(1.75)	(1.52)	(3.07)
Region dummy	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	1,344	1,344	641	641	703	703
Type of autocorrelation	Common	Panel-specific	Common	Panel-specific	Common	Panel-specific

*, **, and *** refer respectively to 10%, 5%, and 1% significance level. Figures in brackets represent *z*-statistics (Normal density).

APPENDIX 4

Table 8. *Results of regressions – Dependent variable: Employment in manufacturing sector*

Variables	(1)	(2)	(3)
GDP per capita	8.18	11.64	9.35
	(0.66)	(0.97)	(0.92)
Investment	−0.17	−0.15	−0.02
	(−1.38)	(−1.26)	(−0.28)
Exports	0.09	0.1	0.24***
	(1.04)	(1.19)	(3.74)
Imports	0.07	0.07	0.004
	(1.53)	(1.56)	(0.17)
Agriculture	−0.22***	−0.23***	−0.15***
	(−9.75)	(−9.97)	(−7.30)
GDPCAP2	−0.61	−0.85	−0.85
	(−0.71)	(−1.02)	(−1.25)
FDI		−37.44	−43.35*
		(−1.39)	(−1.82)
Size of financial sector (M2)			0.12
			(6.48)
Number of observations	71	71	71

*, **, and *** refer respectively to 10%, 5%, and 1% significance level. Figures in brackets represent *t*-statistics (*t*-Student). Results are based on pooled ordinary least squares (OLS) because the panel is highly unbalanced.