



Does Foreign Direct Investment Reduce Poverty in Africa and are there Regional Differences?

GASTON GOHOU

African Development Bank, Tunisia

and

ISSOUF SOUMARÉ*

Laval University, Quebec, Canada

Summary. — This paper re-examines the relationship between foreign direct investment (FDI) inflows and welfare (or poverty reduction) in Africa. Using FDI net inflows *per capita* and the United Nations Development Program's Human Development Index as the principal variables, our analyses confirm the positive and strongly significant relationship between FDI net inflows and poverty reduction in Africa but find significant differences among African regions. We also find that FDI has a greater impact on welfare in poorer countries than it does in wealthier countries. For instance, while the relationship between FDI and poverty reduction is positive and significant for economic communities in Central and East Africa, it is non-significant in Northern and Southern Africa. Furthermore, the relationship was found to be ambiguous in West Africa. Our results are robust to many model specifications.
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1. INTRODUCTION

The United Nations' Millennium Declaration of 2000 outlines eight Millennium Development Goals (MDGs) for 2015.¹ All eight aim to accelerate human development and reduce poverty in developing nations. Unfortunately, at present, most African countries are off-track with respect to meeting these goals. To redress the situation, significant amounts of capital investments are required. An important source of capital investments is foreign direct investment (FDI). In most African countries, the private sector is recognized as a principal driver of growth. Hence, FDI is critical to achieving the MDGs. As the financial and economic crises have persisted, however, most developed countries have begun to design economic and fiscal policies to keep capital at home, thus putting the MDGs in even greater jeopardy.² Because of their development levels, African countries need continuous foreign investments to stimulate their economies and trigger reductions in poverty. Over recent decades, FDI to Africa has increased both in terms of average net inflows of FDI *per capita* and as a proportion of the gross domestic product (GDP) (United Nations Conference on Trade, 2010b). At the same time, real *per capita* GDP as well as the Human Development Index (HDI)³ has been improving (United Nations Development Programme (UNDP), 2010). More FDI, thus, appears to be linked to better welfare⁴ or less poverty.

The literature is rich in studies analyzing the causal relationship between FDI and economic growth (e.g., Alfaro, 2003; Alfaro, Chanda, Kalemli-Ozcan, & Sayek, 2004; Alfaro, Chanda, Kalemli-Ozcan, & Sayek, 2010; Apergis, Lyroutdia, & Vamvakidis, 2008; Carkovic & Levine, 2005; Chowdhury and Mavrotas; Hansen & Rand, 2006). These studies analyze the overall impact of FDI on economic growth, assuming a perfect positive correlation between economic growth and welfare. However, this assumption has been questioned (e.g.,

Anand & Sen, 2000). Indeed, economic growth with inequality may maintain or increase the level of poverty in a country. More specifically, even if economic growth has been found to be necessary in improving well-being, economic growth that is not pro-poor (i.e., not redistributive) may create inequality and may actually negatively impact welfare (Ravallion, 2007).

At the same time, the literature has been limited due to the difficulty in measuring welfare and economic development. Two popular indicators in this area are GDP *per capita*

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and poverty incidence.⁵ The former is widely used and is available for all countries on an annual basis though it only measures one dimension of development. The latter is a good measure of overall well-being, but the data are not available for all countries. Even where the data are available, not all countries use the same measurement indicators. Over the last three decades, the United Nations Development Program's (UNDP) HDI has become (almost) the universally accepted measure of human development. At present, HDI is readily available for all countries. Nonetheless, the few researchers who have used HDI to analyze FDI's direct impact on welfare have focused on Asia or on low- and middle-income countries (Sharma & Gani, 2004). To our knowledge, no study using HDI has been carried out for African countries.

Finally, several studies have shown economic integration to be important in attracting FDI. Asiedu (2006), for example, finds that the size of a country's market as measured by GDP is a key determinant of FDI inflows. The majority of African countries have relatively small markets. To overcome this limitation, most multilateral and bilateral development agencies promote regional integration as a means of attracting FDI and, thereby, improving growth and reducing poverty (UNCTAD, 2010a; UNECA, 2010).

This paper studies the relationship between FDI net inflows and poverty reduction in Africa, especially in Africa's regional economic communities (RECs). We explore two research questions: (1) does FDI reduce poverty in Africa? and (2) does FDI reduce poverty more in some African regions than in others?

We consider five RECs: the Arab Maghreb Union (AMU), the Economic Community of Central African States (ECCAS), the Economic Community of West African States (ECOWAS), the Intergovernmental Authority for Development (IGAD), and the Southern African Development Community (SADC). We also consider five customs and monetary unions: the Economic and Monetary Community of Central Africa (CEMAC), the East African Community (EAC), the Southern African Customs Union (SACU), the West African Economic and Monetary Union (WAEMU), and the embryonic West African Monetary Zone (WAMZ).

Insofar as capturing levels of human development is concerned, we use HDI as our key welfare or poverty-reduction indicator. As a check and to ensure robustness, we also use an alternate welfare measure common to the literature, real GDP *per capita*. To measure FDI, we use net *per capita* inflows of FDI. Our alternative measure is the ratio of total FDI net inflows over GDP and the ratio of total FDI net inflows over gross capital formation (GCF).

This paper's contribution to the literature is twofold. First, we believe this study to be the first to analyze the extent to which FDI reduces poverty in Africa. Second, our study analyzes how membership in an REC impacts the ability of FDI to reduce poverty. Using the Granger causality Wald test, our analyses find a positive causal relationship between FDI and welfare in Africa. Moreover, our panel and cross-sectional regression analyses indicate that FDI impacts welfare positively and significantly in Africa and that the relationship is robust to different model specifications. However, FDI's impact on welfare differs between African regions. For instance, in Central and East African RECs (CEMAC, EAC, ECCAS, and IGAD), FDI impacts welfare positively and significantly, whereas in Southern and Northern African RECs (AMU, SACU, and SADC), the impact of FDI on welfare is not significant and in West Africa (ECOWAS), it is ambiguous; that is, its impact is negative and non-significant in the WAEMU region and is positive and non-significant in the WAMZ region.

This paper is organized as follows. Section 2 reviews the literature on the relationship between FDI and economic growth and between FDI and welfare. Section 3 discusses our methodology and describes our variables and our sample of countries and regions. Section 4 presents the empirical results of our analysis of the relationship between FDI and welfare in Africa and Africa's RECs. Section 5 concludes and formulates policy recommendations.

2. REVIEW OF THE LITERATURE ON FDI AND WELFARE

Numerous studies have analyzed the relationship between FDI and economic growth to determine the extent, if any, to which FDI impacts economic development. The assumption common to these studies is that economic growth improves welfare. Overall, conclusions have been mixed, but most research find that FDI stimulates economic growth. The differences in the findings could arise from a number of methodological and conceptual factors, such as the lack of a comprehensive, harmonized dataset, different definitions of FDI, and different econometric specifications.

This section begins by reviewing the theory on the transmission mechanisms between FDI and welfare. It then discusses the causality between FDI and economic growth and reviews recent findings in that regard. Finally, it presents the main findings on the link between the degree of development of a country's financial market and the impact of FDI.

(a) *Theoretical arguments: the link between FDI and welfare*

Since World War II (WWII), two trends have characterized the evolution of FDI in developing countries. First, from the end of WWII to the end of the Cold War in the 1990s, FDI flows and stocks increased around the world, especially in developing countries. During this period, FDI flows were mainly driven by political rather than by economic motives. Second, since the 1990s, FDIs have been concentrated in countries that offer fiscal benefits, subsidies, and other incentives.

The impact of FDI on human development can be analyzed from at least two viewpoints. On the social side, reducing poverty and improving welfare are the priorities of the governments of developing countries. Foreign investment can help achieve these goals because investments create jobs, develop local skills, and stimulate technological progress. On the economic side, recent literature on endogenous growth suggests that human capital may be the principal contributor to self-sustained growth in GDP *per capita*.⁶ One of the main contributors to human capital is human development. It is, then, of prime interest to assess how FDI impacts human development.

FDI can impact welfare through both direct and indirect channels.⁷ A direct channel consists of spillovers to the private sector (backward and forward linkages). Spillovers can take place if FDI creates positive vertical spillover effects with local suppliers (backward linkages) through local sourcing and firms (forward linkages). FDI may also create positive horizontal spillovers by promoting and enhancing competition and causing new technologies to be implemented. In addition to these positive spillovers to local firms, FDI can impact welfare directly by creating jobs for new workers. For this channel to be efficient, the number of jobs created must be greater than the number of jobs lost as a result of FDI-related activities—layoffs pursuant to mergers and acquisitions, the closing of local firms, *etc.* FDI in a labor-intensive, pro-poor sector such as agriculture is, thus, likely to have the greatest impact on welfare.

FDI's indirect impacts on welfare occur at the macroeconomic level. If a country's overall net transfer of revenues is positive,⁸ it is likely that FDI will increase a country's total investments. This is assumed to increase economic growth. In this case, however, the link to welfare is not direct.

We see, from this discussion, that the FDI policy regime and the type of FDI are of crucial importance to FDI's ability to improve welfare. If FDI is only used to purchase raw materials for a firm outside the host country, then the scope for job creation and spillovers is limited. If, in contrast, FDI targets access to a specific domestic market, then its impact on jobs and its backward and forward linkages are likely to be high.

(b) *Tests of the direct relationship between FDI and economic growth*

Much research has used econometric techniques, such as the Granger causality test and the Toda-Yamamoto test to study the direction of the causality between FDI and economic growth. The findings are mixed. Recently, Chowdhury and Mavrotas (2006) used the Toda-Yamamoto method to test the direction of causality between FDI and GDP growth for three major FDI recipients (Chile, Malaysia, and Thailand) between 1969 and 2000. Their empirical findings suggest that in Chile, GDP growth caused FDI net inflows and not *vice versa*. In Malaysia and Thailand, the authors found strong evidence of bidirectional causality between GDP growth and FDI inflows. In another study, Hansen and Rand (2006) examined the causal links between FDI and economic growth in 31 developing countries over 31 years (1970–2000). They used bivariate vector autoregressive models for GDP and FDI ratios and found a strong causal link between FDI and GDP, even in the long run. Finally, Carkovic and Levine (2005) studied the relationship between FDI and economic growth for 72 countries and found no support for the claim that FDI accelerates economic growth. This finding contrasts the findings of the first two papers cited herein.

Confronted with these mixed results on the causal link between FDI and economic growth at a general level, some researchers have analyzed the link in specific economic sectors or particular regions. For example, Alfaro (2003) examined how FDI affected growth in the primary, manufacturing, and services sectors and found great variance. Using cross-country data between 1981 and 1999, Alfaro's findings suggest that, in general, FDI has an ambiguous effect on growth as its effects in the primary sector are negative, its effects in the manufacturing sector are positive, and its effects in the services sector are unclear.

As for regional analyses, Apergis *et al.* (2008) examined the impact of FDI on economic growth using a panel dataset from 27 transitional European economies between 1991 and 2004. Their empirical findings indicate that FDI exhibits a significantly positive relationship with economic growth, at least in transitional countries with high levels of income and successful privatization programs.

Several other authors have found similar results using different databases and methodologies. A good example is Alfaro and Charlton (2007), who distinguished different "qualities"⁹ of FDI to reexamine the relationship between FDI and growth. Exploiting a new, comprehensive, industry-level dataset for 29 countries between 1985 and 2000, the authors found that the growth effects of FDI increase when analyses account for the quality of FDI. After controlling for industry characteristics and time effects, the authors found that the relation between FDI and economic growth was no longer ambiguous but, rather, positive and significant.

(c) *The role of financial markets*

Although it is possible to test the direct relationship between FDI and economic growth, it is legitimate to assume that FDI tends to flow to those countries with more developed financial markets or that FDI helps develop financial markets, thus leading to economic growth. Indeed, empirical evidence suggests that an advanced financial market is a good predictor of FDI inflows. With this in mind, several authors have studied how the development of financial systems strengthens the relationship between FDI and economic growth.¹⁰

Hermes and Lensink (2003) investigated exactly this question. Using a dataset from 67 countries, mostly in Latin America and Asia, they found that the development of a financial system in the recipient country is an important precondition for FDI to positively impact economic growth. A more developed financial system contributes to the technological diffusion associated with FDI inflows. Of the 67 countries in the dataset, the financial systems of 37 countries were sufficiently developed for FDI to stimulate economic growth.

Alfaro *et al.* (2004) examined the same issue using cross-country data between 1975 and 1995 and found that FDI alone plays an ambiguous role in economic growth but that countries with well-developed financial markets gained significantly from FDI. More recently, Alfaro *et al.* (2010) develop a theoretical model to formalize a mechanism that emphasizes the role of local financial markets in enabling FDI to promote growth through backward linkages. Their calibration exercises lead to similar findings.

Dutta and Roy (2011) empirically investigated the role of political risk in the association between FDI and financial development. Using a panel of 97 countries over 20 years, they established a non-linear association between financial development and FDI inflows. They found that financial development leads to greater FDI inflows up to a certain level of financial development; however, beyond that level the association becomes negative. The authors further found that political risk factors influence the relationship by altering the threshold of financial development. In countries and periods that are more politically stable, the point at which the negative association begins is reached at a higher level of financial development. This suggests that advanced financial markets and political stability must co-exist for a country to capture and enjoy the benefits of FDI. Kholdy and Sohrabian (2008) reached similar conclusions.

Kholdy and Sohrabian (2005) investigated various links between financial markets, FDI, and economic growth. Using data from 25 countries between 1975 and 2002 and employing the Granger causality model, the authors found bidirectional links between financial markets and economic growth. In countries with low GDP *per capita*, economic growth stimulates financial development; however, the direction of causality is reversed for countries with higher GDP *per capita*. The authors also found bidirectional causality between financial markets and FDI in countries with higher GDP *per capita* and more developed financial markets.

Eller, Haiss, and Steiner (2006) examine the impact of financial sector foreign direct investment (FSFDI) on economic growth by estimating a panel data model for 11 Central and Eastern European countries between 1996 and 2003 in a cross-country growth accounting framework. The results clearly indicate that a relationship between FSFDI and economic growth can exist. Approaching a medium degree of financial services mergers and acquisitions is rewarded by higher economic growth after two periods. Beyond these two periods, FSFDI appears to spur economic growth depending

on a higher human capital stock. FSFDI-induced knowledge spillovers to domestic banks can be an explanation for this phenomenon. Above a certain threshold, the crowding-out of local physical capital caused by the entry of a foreign bank appears to hamper economic growth (p. 2).

(d) Summary

Research that has examined the relationship between FDI and economic growth using FDI and GDP growth variables has shown mixed results. Furthermore, while literature on the impact of FDI on economic growth is ubiquitous, literature on the impact of FDI on welfare is lacking. Basically, most studies have assumed that economic growth and welfare are perfectly and positively correlated and have thus used GDP growth as a proxy for welfare. This assumption has recently been challenged, and evidence from several sources now indicates that GDP can grow even as poverty is on the rise.

To overcome this limitation, a small number of papers have analyzed the direct relation between FDI and welfare. Of the few authors to have used HDI as a measure of welfare, Sharma and Gani (2004) found a positive effect of FDI on HDI for middle- and low-income countries between 1975 and 1999.¹¹ As far as we know, no such study has been conducted solely for African countries.

Table 1 summarizes the variables commonly used in the literature and the direction of their impact on economic growth. We see that, in general, the relationship between FDI and economic growth is ambiguous.

3. VARIABLES, SAMPLE, AND METHODOLOGY

(a) Variables

The main variables we use to explain the impact of FDI on welfare are the net flow of FDI, the HDI, and the GDP *per capita*. We also use a number of control variables.

(i) Foreign direct investment

FDI is measured by FDI net inflows, that is, the sum of equity capital, reinvested earnings, long-term capital, and short-term capital as shown in the balance of payment. We use three FDI variables: (i) *FDIPOP*: *per capita* FDI or the ratio of FDI net inflows over total population; (ii) *FDIGDP*: the ratio of FDI net inflows over GDP; and (iii) *FDIGCF*: the ratio of FDI net inflows over gross capital formation (GCF).

(ii) Welfare variables

The literature has used several measures to assess countries' progress toward improved welfare, including GDP *per capita* and poverty incidence. GDP *per capita* only captures the economic dimension of welfare. This is a problem as development is a multidimensional phenomenon, and welfare depends not only on economic factors but on health care, education, and other factors as well. In contrast, poverty incidence is a comprehensive measure of a country's well-being, as it compares all aspects of individuals' living conditions (health, education, access to basic services, nutrition, *etc.*) to the threshold needed for a decent standard of living. Nevertheless, poverty incidence is not recorded annually and is too country-specific to be aggregated across countries. These limitations do not allow it to be used in empirical studies. It must be noted that an international poverty incidence is calculated based on a poverty line of US \$1.25 per day. However, we did not use these data because of their non-availability for a number of years and the fact that the data are too general.

For these reasons, the main population welfare measure used in this paper is HDI. Defined by the UNDP, HDI is a summary composite index that measures a country's average achievements in three basic aspects of human development: health, knowledge, and standard of living. Health is measured by life expectancy at birth. Knowledge is measured by a combination of the adult literacy rate and the combined primary, secondary, and tertiary gross enrollment ratio. Standard of living is defined by GDP *per capita* (purchasing power parity US \$) (UNDP, 2010).¹² HDI, while imperfect, is the most

Table 1. Review of the literature on the sign of variables used to explain the impact of FDI on economic growth or welfare

Explanatory variable	Causality test on the impact of FDI on economic growth			Dependent variable				
				Welfare (HDI)		Real <i>per capita</i> GDP growth rate		
	Kholdy and Sohrabian (2005)	Hansen and Rand (2006)	Chowdhury and Mavrotas (2006)	Sharma and Gani (2004)	Apergis et al. (2008)	Alfaro et al. (2004)	Alfaro (2003)	Carkovic and Levine (2005)
FDI/GDP	No impact	Yes impact	No/yes	+	+	+/- NS	+ NS	+/- NS
<i>Economic and policy</i>								
Government spending				+		+/- NS	- NS	-
Economic growth				-/+ NS				
Infant mortality				-				
Schooling					+	+/- NS	+ NS	+/- NS
Population growth						-		
Inflation						-NS	-	-/+ NS
Log (initial GDP)						-	-	-
Openness							- NS	+
Investment (GCF/GDP)							+	
<i>Business Environment and Institutions</i>								
Black market premium						-		-
Financial market development						-/+ NS	+	+
Institutional quality						+	+	
<i>Political risk</i> (Freedom status)								+/- NS

Notes: FDI, foreign direct investment; GCF, gross capital formation; GDP, gross domestic product; the + sign, a positive coefficient; the - sign, a negative coefficient; NS, a non-significant coefficient; +NS, a positive but non-significant coefficient; -NS, a negative but non-significant coefficient.

universally consensual measure of a country's human development. To compare our results with those of the literature and to check their robustness, we use real GDP *per capita* (GDP-POP) as an alternative welfare measure.

(iii) Control variables

To improve our empirical analyses, we consider three sets of control variables: (i) economic and policy variables, (ii) business environment and institutional quality variables, and (iii) political risk variables.

Economic and policy variables

- total debt ratio (*DEBTGDP*) measured as total debt outstanding over GDP;
- government spending ratio (*GOVSPEND*) measured as government total consumption over GDP (also used to capture government size);
- inflation (*INFLATION*) measured as the percent of change in the GDP deflator;
- three infrastructure variables: the number of fixed and mobile phones per 100 habitants (*PHONE*), kilometers of road paved per 100 habitants (*ROAD*), and the number of internet users per 100 habitants (*INTERNET*);
- education (*EDUCATION*) measured as the gross enrollment ratio (*GER*) for all levels of education (used as a control variable when real per capita GDP is used as a welfare variable);
- degree of openness (*OPENNESS*) measured as total imports plus exports over GDP.

Business environment and institutional quality variables

- rule of law index (*LAW*), which measures the effectiveness of the rule of law and the degree to which investors are protected (World Resources Institute¹³);
- corruption perceptions index (*CPI*) of Transparency International, which gauges transparency;
- financial market development measured in two ways: total credit by financial intermediaries to the private sector over GDP (this measures a country's financial intermediation level) (*CREDIT*) and stock market capitalization over GDP (*MKTCAP*).

Political risk variables (from Freedom House)

- political rights rating (*POLRIGHTS*), which measures freedom for political activism;
- civil liberties rating (*CIVILLIB*), which measures latitude for the exercise of civil freedoms.

Table 2 lists these variables and identifies the sources of data for each.

(b) Sample

As mentioned above, regional economic integration is becoming an increasingly important engine for economic growth and human development. Economic integration among neighboring countries is growing around the world. Multilateral development institutions, such as the African Development Bank and the World Bank emphasize the need for regional integration in their strategic plans and are scaling up actions in this direction. As one of the objectives of this paper is to study regional differences in the relationship between FDI and welfare, our sample includes five African free-trade areas. Inside these areas are five customs and monetary unions with higher levels of integration. Our sample includes these as well. Table 3 identifies African countries' affiliations by regional economic community (REC).

Our sample thus comprises 52 African countries for the 1990–2007 period. Table 4 presents statistics for Africa. All variables except MKTCAP and CPI have at least 400 coun-

try-year observations. When data are not available for a given country, we remove the country from the dataset before running panel regressions. In our regional analysis, we drop variables with incomplete data to safeguard consistency across regions.

(c) Model specification

To study the impact of FDI on welfare, we run the following regression:

$$\begin{aligned} \text{Welfare} = & \alpha + \beta \times \text{FDI} + \sum \gamma_{1i} \times \text{Economic \& Policy } var_i \\ & + \sum \gamma_{2j} \times \text{Business Env. \& Inst. } var_j \\ & + \sum \gamma_{3k} \times \text{Political Risks } var_k + \varepsilon \end{aligned} \quad (1)$$

where welfare is measured by HDI or real *per capita* GDP, FDI is measured by *per capita* FDI, the ratio of FDI to GDP, or the ratio of FDI to GCF, and the control variables are the economic and policy variables, the business environment and institutional quality variables, and the political risk variables listed in Section 3a and Table 2.

Insofar as the control variables are concerned, we expect government spending to improve welfare because HDI measures the fruit of developing countries' investments in education and health as well as countries' economic performances, all of which stem mainly from government spending and/or FDI. Especially in developing countries, citizens' basic needs are principally ensured by government spending. At the same time, a large portion of government financing comes from debt. For that reason, introducing the debt ratio as a control variable is expected to account for the government's financial constraints, with the debt ratio expected to have a negative impact on welfare, as the higher the indebtedness of a country, the more constrained the government's capacity to respond to the basic needs of its population. Inflation is introduced to capture macroeconomic instability. Inflation is expected to have a negative impact on welfare as high inflation increases the price of basic goods and directly impacts the poor.

The development of infrastructure contributes to better living conditions and is expected to have a positive impact on welfare. We consider three measures of infrastructure: kilometers of road paved per 100 habitants, the number of internet users per 100 habitants, and the number of fixed and mobile phone users per 100 habitants.

The openness-to-trade indicator, another control variable, shows how friendly a country is to FDI. This indicator is measured as the ratio of total exports plus imports over GDP. The level of a population's education indicates the quality of the country's human capital. Measured as the gross enrollment ratio for all levels of education,¹⁴ the education indicator is only used as a control variable in regressions where *per capita* GDP is used as the dependent welfare variable. We expect openness and education to have positive impacts on welfare.

Finally, African countries are generally characterized by low levels of institutional efficiency and an underdeveloped business environment, both of which negatively impact FDI. We control for these effects with variables related to the business environment, the quality of institutions, and the political risks.

4. EMPIRICAL ANALYSES

The aim of this paper is to assess the impact of FDI on welfare in Africa at the regional level. It addresses two research questions:

Table 2. *The variables: description and sources of data*

Variable	Description	Source of data
<i>Welfare</i>		
<i>HDI</i>	Human Development Index	The Human Development Report of the United Nations Development Programme
<i>GDPPOP</i>	Real <i>per capita</i> gross domestic product (GDP)	The World Bank's World Development Indicators (WDIs)
<i>Foreign direct investment</i>		
<i>FDIPOP</i>	<i>Per capita</i> foreign direct investment (FDI)	WDIs and the World Bank's Global Development Finance (GDF) database
<i>FDIGDP</i>	FDI/GDP	WDIs and GDF
<i>FDIGCF</i>	FDI/gross capital formation	WDIs and GDF
<i>Economic and policy</i>		
<i>DEBTGDP</i>	Total debt/GDP	WDIs and the World Bank's African Development Indicators (ADIs)
<i>GOVSPEND</i>	Government consumption/GDP	WDIs and ADIs
<i>INFLATION</i>	Percentage change in GDP deflator	WDIs and ADIs
<i>PHONE</i>	Fixed and mobile phones users per 100 inhabitants	WDIs and ADIs
<i>INTERNET</i>	Internet users per 100 inhabitants	WDIs and ADIs
<i>ROAD</i>	Km of road paved per 100 inhabitants	WDIs and ADIs
<i>OPENNESS</i>	Imports + exports / GDP	WDIs and ADIs
<i>EDUCATION</i>	Gross enrollment ratio for all levels of education	The UNESCO database
<i>Business environment and institutional quality</i>		
<i>LAW</i>	Rule of law index ^a	The World Resources Institute
<i>CPI</i>	Corruption perceptions index ^b	Transparency International
<i>MKTCAP</i>	Stock market capitalization/GDP	GDF and New World Bank database on financial development and structure ^c
<i>CREDIT</i>	Credit by financial intermediaries to private sector/GDP	
<i>Political risks</i>		
<i>POLRIGHTS</i>	Political rights rating ^d	Freedom House
<i>CIVILLIB</i>	Civil liberties rating ^e	Freedom House

^a Values are indexed to have a mean of zero and a standard deviation of one index unit. Positive scores indicate better governance and 99% of values fall between 2.5 and -2.5.

^b CPI assigns a value of 1 to the most corrupt country and 10 to the least corrupt.

^c Obtained from <http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTRESEARCH/0,,contentMDK:2069616~pagePK:64214825~piPK:64214943~theSitePK:469382,00.html>.

^d *POLRIGHTS* assigns a value of 1 to countries with the most political rights and a value of 7 to countries with the least such rights.

^e *CIVILLIB* assigns a value of 1 to countries with the most civil freedoms and a value of 7 to countries with the least such freedoms.

- (1) Does FDI reduce poverty in Africa?
- (2) Does FDI reduce poverty more in some African regions than in others?

(a) *Descriptive statistics*

Table 5 provides descriptive statistics for welfare variables (HDI and real *per capita* GDP) and FDI variables in Africa and its RECs. We observe considerable differences in the distribution and flow of FDI, real *per capita* GDP, and HDI across regions. The gap between the African regions is even larger when measured in terms of *per capita* FDI. This underscores the importance of choosing the best variable for the problem under study. We mainly use *per capita* FDI because this indicator gives the best idea of the distribution of FDI at the individual level, an important indication of the impact of FDI on welfare.

The results of Table 5 show that AMU, SACU, and SADC countries exceed the African average for HDI, real *per capita* GDP, and *per capita* FDI. While weighted average HDI and average *per capita* FDI for Africa are 0.437 and 16.724, respectively, these values for SACU countries are 0.658 and 39.013; for SADC countries, they are 0.460 and 17.951; and for AMU countries, they are 0.607 and 23.525. Thus, regions with the

highest HDI also have the highest *per capita* FDI. A different trend is observed when we consider the FDI/GDP and FDI/GCF measures where AMU, SACU, and SADC countries fall below the African average because of the size of their economies. On the other hand, ECCAS and ECOWAS countries exceed the average.

Table 6 presents the variables correlation matrix for Africa calculated using country-year data. Three areas of this matrix are of interest to us. The first is the upper left shaded area, which corresponds to correlations between welfare variables (HDI and real *per capita* GDP) and FDI variables. The second is the middle shaded area, which shows correlations between the economic and policy variables. The third is the lower right shaded area, which displays correlations between business environment variables, institutional quality variables, and political risk variables.

The first area of the matrix shows that the two welfare variables, HDI and real *per capita* GDP, have a high correlation of approximately 70%. The 30% loss of correlation supports the claim that economic growth does not entirely translate into better welfare. For the FDI variables, we observe that the FDI/GDP and FDI/GCF ratios are highly correlated (64%), but their correlation with *per capita* FDI is relatively low (below 40%).

Table 3. Countries in the study sample by regional economic community

Free-trade areas		Custom and monetary unions									
AMU + Egypt (6)	ECCAS (11)	ECOWAS (15)	IGAD (7)	SADC (15)	CEMAC (6)	EAC (5)	SACU (5)	WAEMU (8)	WAMZ (5)		
Algeria	Angola	Benin	Djibouti	Angola	Cameroon	Burundi	Botswana	Benin	Gambia		
Egypt	Burundi	Burkina Faso	Eritrea	Botswana	Central African Republic	Kenya	Lesotho	Burkina Faso	Ghana		
Libya	Cameroon	Cap Verde	Ethiopia	Democratic Republic of the Congo	Chad	Rwanda	Democratic Republic of the Congo	Côte d'Ivoire			
Mauritania	Central African Republic	Côte d'Ivoire	Kenya	Lesotho	Congo	Tanzania	Lesotho	Guinea Bissau	Guinea		
Morocco	Chad	Gambia	Somalia	Madagascar	Equatorial Guinea	Uganda	Madagascar	Mali	Nigeria		
Tunisia	Congo	Ghana	Sudan	Malawi	Gabon		Malawi	Niger	Sierra Leone		
	Democratic Republic of the Congo	Guinea	Uganda	Mauritius			Mauritius	Senegal	Sierra Leone		
	of the Congo	Guinea Bissau		Mozambique			Mozambique	Togo			
	Equatorial Guinea	Liberia		Namibia			Namibia				
	Gabon	Mali		Seychelles			Seychelles				
	Rwanda	Niger		South Africa			South Africa				
	Sao Tomé & Príncipe	Nigeria		Swaziland			Swaziland				
		Senegal		Tanzania			Tanzania				
		Sierra Leone		Zambia			Zambia				
		Togo		Zimbabwe			Zimbabwe				

Notes: AMU, Arab Maghreb Union; CEMAC, Economic and Monetary Community of Central Africa; EAC, East African Community; ECCAS, Economic Community of Central African States; ECOWAS, Economic Community of West African States; IGAD, Intergovernmental Authority for Development; SACU, Southern African Customs Union; SADC, Southern African Development Community; WAEMU, West African Economic and Monetary Union; WAMZ, West African Monetary Zone.

In the second area, *EDUCATION* is highly correlated with HDI (80%) and real *per capita* GDP (76%). This was expected as education and GDP are components of HDI. We also observe that *EDUCATION* is highly correlated with the infrastructure variables (*PHONE*, *INTERNET*, and *ROAD*). For example, with the *PHONE* variable, the correlation is 73%. The three infrastructure variables are also highly correlated, especially that of *PHONE* and *INTERNET* at 83%. This high correlation allows us to perform our analysis with a single infrastructure variable. We chose *PHONE*, the variable for which the most data are available.¹⁵

The third area showcases the correlations between the business environment variables, the institutional quality variables, and the political risk variables. The correlation is high (80%) between the market capitalization ratio (*MKTCAP*) and the ratio of credit by financial intermediaries to the private sector (*CREDIT*). These two variables measure the degree of financial intermediation or development of the financial market. Given the limited data available for *MKTCAP* (261 points), we retained *CREDIT* for our empirical tests. At 82%, the rule of law index (*LAW*) and the corruption perceptions index (*CPI*) are highly correlated. These two variables are also highly correlated with the political risk variables (*POLRIGHTS* and *CIVILLIB*). Therefore, because of data availability, we dropped *CPI* (only 256 points) and *LAW* (456 points) for most estimates. Finally, at 88%, the two political risk variables (*POLRIGHTS* and *CIVILLIB*) are highly correlated. Therefore, we retained *CIVILLIB*.

(b) Impact of FDI on welfare in Africa

This section addresses our first research question: does FDI reduce poverty in Africa? We conducted the Granger causality test on panel data (e.g., Hood, Kidd, & Morris, 2008) first between HDI and *per capita* FDI and second between real *per capita* GDP (the alternative welfare indicator) and *per capita* FDI. The results are shown in Table 7. To conduct the Granger causality test, we first tested the stationarity of the variables. As we had panel data, we used the Levin, Lin, and Chu (2002) and Im, Pesaran, and Shin (2003) stationarity tests, hereafter called LLC and IPS, to test for the existence of a unit root in the data series for HDI, *per capita* FDI, and real *per capita* GDP. Adding lags in the LLC unit root test yields the augmented Dickey-Fuller unit root test. The results presented in panel A of Table 7 reject the existence of unit roots for the three variables (HDI, *per capita* FDI, and real *per capita* GDP). In other words, we reject the non-stationarity hypothesis for these three variables.

The results of the causality test between FDI and HDI in panel B of Table 7 show that FDI causes HDI in at least one or more countries in the sample; thus, we reject the null hypothesis that *per capita* FDI does not Granger-cause HDI. Continuing with the homogeneous causality test, we accept the homogeneous structure of the causality in the sample and conclude that FDI causes HDI. Conversely, testing the causality of HDI toward FDI, we cannot reject the null hypothesis that HDI does not Granger-cause *per capita* FDI. It is, therefore, unnecessary to test for homogenous causality, and we can conclude that HDI does not Granger-cause *per capita* FDI. In sum, the direction of the causality is from FDI to HDI.

Panel C of Table 7 shows bidirectional causality between *per capita* FDI and real *per capita* GDP in at least one country. While we can reject homogeneous causality from FDI toward real *per capita* GDP, we cannot reject homogeneous causality in the opposite direction. The causality between *per capita*

Table 4. *Statistics for African Countries, 1990–2007*

Variable	<i>N</i>	Mean	Std Dev	Minimum	Maximum
<i>Welfare</i>					
<i>HDI</i>	850	0.4430	0.1754	0.0450	0.8480
<i>GDPPOP</i>	828	1069.0700	1369.2500	50.1288	7058.2500
<i>Log(GDPPOP)</i>	828	6.4153	1.0070	3.9146	8.8620
<i>Foreign direct investment</i>					
<i>FDIPOP</i>	839	52.2350	274.0363	−451.7792	3842.2000
<i>FDIGDP</i>	815	0.0367	0.1037	−0.8289	1.4520
<i>FDIGCF</i>	789	0.1613	0.4443	−0.5273	9.6789
<i>Economic and policy</i>					
<i>DEBTGDP</i>	815	1.1028	1.3029	0.0325	15.9820
<i>GOVSPEND</i>	796	0.1570	0.0789	0.0290	0.6950
<i>INFLATION</i>	891	73.6870	943.0654	−24.0764	26762.0200
<i>PHONE</i>	891	7.8881	16.0567	0.0000	115.1108
<i>Log(PHONE)</i>	883	0.6472	1.7426	−3.2736	4.7459
<i>INTERNET</i>	695	1.7413	4.0133	0.0000	37.6329
<i>ROAD</i>	523	28.2099	24.5746	0.8000	100.0000
<i>EDUCATION</i>	791	48.20067	19.24173	8.913059	96.1372
<i>OPENNESS</i>	869	0.7422	0.3881	0.1083	3.1674
<i>Business Environment and Institutional Quality</i>					
<i>MKTCAP</i>	261	0.2986	0.4526	0.0055	3.0029
<i>CREDIT</i>	717	0.1798	0.2069	0.0001	1.5544
<i>LAW</i>	456	−0.6935	0.6789	−2.6400	0.9300
<i>CPI</i>	256	3.0887	1.1399	0.7000	6.4000
<i>Political Risks</i>					
<i>POLRIGHTS</i>	914	4.7177	1.8818	1	7
<i>CIVILLIB</i>	914	4.5131	1.4412	1	7

Note: For an explanation of abbreviations, see Table 2. For the list of African countries, see Table 3.

Table 5. *Evolution of HDI, real per capita GDP, and FDI variables, 1990–2007*

	1990–1994	1995–1999	2000–2004	2005–2007	Overall
<i>Panel A: Aggregate Africa</i>					
<i>Africa</i>					
Weighted HDI ^a	0.338	0.441	0.473	0.498	0.437
Weighted HDI Growth	0.081	0.021	0.001	0.022	0.031
Real per capita GDP	762.673	779.780	840.336	953.437	834.057
Real per capita GDP Growth	−0.014	0.013	0.023	0.034	0.014
Per capita FDI	5.300	11.104	17.431	33.059	16.724
Per capita FDI Growth	0.242	0.158	0.111	0.256	0.192
FDI/GDP	0.008	0.016	0.024	0.031	0.020
FDI/GCF	0.042	0.080	0.117	0.133	0.093
<i>Panel B: African free-trade areas</i>					
<i>AMU</i>					
Weighted HDI ^a	0.494	0.621	0.652	0.693	0.607
Weighted HDI growth	0.073	0.002	0.012	0.020	0.025
Real per capita GDP	1249.619	1324.292	1477.646	1682.095	1405.782
Real per capita GDP growth	0.000	0.021	0.025	0.035	0.020
Per capita FDI	11.514	11.749	21.283	88.599	23.525
Per capita FDI growth	0.292	0.027	0.171	1.228	0.288
FDI/GDP	0.010	0.008	0.014	0.043	0.015
FDI/GCF	0.040	0.037	0.057	0.226	0.066
<i>ECCAS</i>					
Weighted HDI	0.270	0.389	0.407	0.425	0.373
Weighted HDI growth	0.105	0.044	−0.028	0.034	0.039
Real per capita GDP	685.130	678.198	727.792	883.364	743.621
Real per capita GDP growth	−0.050	0.026	0.027	0.064	0.017
Per capita FDI	3.087	12.922	34.655	24.346	18.753
Per capita FDI growth	0.491	1.588	0.218	−0.138	0.540

Table 5 (continued)

	1990–1994	1995–1999	2000–2004	2005–2007	Overall
FDI/GDP	0.008	0.016	0.024	0.031	0.020
FDI/GCF	0.053	0.190	0.443	0.185	0.218
<i>ECOWAS</i>					
Weighted HDI	0.259	0.380	0.436	0.443	0.373
Weighted HDI growth	0.115	0.038	0.002	0.017	0.041
Real per capita GDP	409.737	409.181	458.138	525.422	442.308
Real per capita GDP growth	−0.017	0.009	0.039	0.022	0.014
Per capita FDI	7.180	9.647	10.114	18.740	10.128
Per capita FDI growth	0.231	−0.010	0.049	0.551	0.139
FDI/GDP	0.023	0.028	0.024	0.026	0.025
FDI/GCF	0.127	0.152	0.126	0.108	0.132
<i>IGAD</i>					
Weighted HDI	0.251	0.335	0.411	0.451	0.352
Weighted HDI growth	0.055	0.044	0.021	0.026	0.036
Real per capita GDP	339.492	379.210	426.890	518.249	404.595
Real per capita GDP growth	−0.005	0.034	0.034	0.057	0.029
Per capita FDI	0.510	3.213	7.986	17.931	5.554
Per capita FDI growth	1.174	0.432	0.276	0.334	0.556
FDI/GDP	0.003	0.013	0.031	0.046	0.019
FDI/GCF	0.015	0.075	0.160	0.202	0.097
<i>SADC</i>					
Weighted HDI	0.428	0.475	0.460	0.478	0.460
Weighted HDI growth	0.079	0.004	−0.017	0.028	0.024
Real per capita GDP	1375.829	1373.033	1427.456	1616.958	1448.319
Real per capita GDP growth	−0.022	0.007	0.016	0.043	0.011
Per capita FDI	3.791	19.052	25.161	23.800	17.951
Per capita FDI growth	4.135	0.770	0.204	0.751	1.465
FDI/GDP	0.004	0.020	0.028	0.014	0.016
FDI/GCF	0.023	0.112	0.166	0.082	0.096
Panel C: African customs unions					
<i>CEMAC</i>					
Weighted HDI ^a	0.312	0.439	0.463	0.463	0.419
Weighted HDI growth	0.110	0.021	−0.010	0.018	0.035
Real per capita GDP	841.032	823.384	878.558	952.186	873.790
Real per capita GDP growth	−0.034	0.012	0.024	0.010	0.003
Per capita FDI	−0.222	8.879	55.565	94.166	39.597
Per capita FDI growth	2.375	4.099	0.452	0.099	1.756
FDI/GDP	0.000	0.014	0.070	0.074	0.039
FDI/GCF	−0.003	0.054	0.276	0.317	0.161
<i>EAC</i>					
Weighted HDI	0.323	0.392	0.445	0.469	0.407
Weighted HDI growth	0.033	0.023	0.006	0.028	0.022
Real per capita GDP	330.336	335.805	347.283	377.478	347.726
Real per capita GDP growth	−0.018	0.017	0.008	0.031	0.009
Per capita FDI	0.785	4.112	5.769	7.324	4.498
Per capita FDI growth	0.587	0.367	−0.013	0.139	0.270
FDI/GDP	0.004	0.014	0.020	0.019	0.014
FDI/GCF	0.020	0.086	0.111	0.099	0.079
<i>SACU</i>					
Weighted HDI	0.639	0.683	0.659	0.650	0.658
Weighted HDI growth	0.047	−0.001	−0.007	0.007	0.012
Real per capita GDP	2826.338	2838.511	2997.693	3427.749	3022.573
Real per capita GDP growth	−0.015	0.004	0.022	0.042	0.013
Per capita FDI	3.663	43.562	50.320	58.507	39.013
Per capita FDI growth	0.856	0.932	0.743	1.792	1.081
FDI/GDP	0.001	0.013	0.018	0.014	0.012
FDI/GCF	0.006	0.074	0.107	0.084	0.068
<i>WAEMU</i>					
Weighted HDI	0.202	0.313	0.376	0.400	0.323
Weighted HDI growth	0.133	0.056	−0.006	0.050	0.058

(continued on next page)

Table 5 (continued)

	1990–1994	1995–1999	2000–2004	2005–2007	Overall
Real <i>per capita</i> GDP	522.472	543.402	549.271	558.942	543.522
Real <i>per capita</i> GDP growth	–0.020	0.023	–0.004	0.007	0.001
<i>Per capita</i> FDI	2.119	7.777	7.126	8.628	6.412
<i>Per capita</i> FDI growth	1.024	0.296	0.007	0.078	0.351
FDI/GDP	0.005	0.019	0.018	0.016	0.014
FDI/GCF	0.037	0.120	0.115	0.089	0.090
<i>WAMZ</i>					
Weighted HDI	0.285	0.411	0.463	0.463	0.405
Weighted HDI growth	0.112	0.031	0.005	0.004	0.038
Real <i>per capita</i> GDP	361.196	349.835	418.520	514.242	410.948
Real <i>per capita</i> GDP growth	–0.015	–0.002	0.068	0.031	0.020
<i>Per capita</i> FDI	9.309	9.834	10.843	23.276	13.316
<i>Per capita</i> FDI growth	0.321	–0.067	0.084	0.799	0.284
FDI/GDP	0.034	0.032	0.025	0.028	0.030
FDI/GCF	0.169	0.170	0.123	0.118	0.145

Notes: FDI, foreign direct investment; GCF, gross capital formation; GDP, gross domestic product; HDI, Human Development Index. AMU, Arab Maghreb Union; ECCAS, Economic Community of Central African States; ECOWAS, Economic Community of West African States; FDI, foreign direct investment; GCF, gross capital formation; GDP, gross domestic product; HDI, Human Development Index; IGAD, Intergovernmental Authority for Development; SADC, Southern African Development Community. CEMAC, Economic and Monetary Community of Central Africa; EAC, East African Community; SACU, Southern African Customs Union; WAEMU, West African Economic and Monetary Union; and WAMZ, West African Monetary Zone.

^a Weighted HDI is the average HDI weighted by country population size.

FDI and real *per capita* GDP is bi-directional although not homogeneous in both directions.

In summary, we cannot reject the hypothesis that *per capita* FDI increases HDI or real *per capita* GDP. Furthermore, with the real *per capita* GDP measure, we cannot reject the existence of a positive bidirectional relationship between *per capita* FDI and real *per capita* GDP. Hence, based on the causality test, it appears that FDI causes HDI and that when *per capita* GDP is used as an alternative welfare measure, the causality becomes bidirectional.

To assess the impact of FDI on welfare in Africa, we use Eq. (1) (Section 3c). Table 8 gives the panel regression results for Africa when we use HDI as the dependent variable for welfare. Columns 1, 2, and 3 each use a different FDI variable as the explanatory variable without controls. The results show that *per capita* FDI positively impacts welfare at a significance level of 1%. When we use alternative FDI variables (*FDIGDP* and *FDIGCF*), the regression coefficient is no longer significant, as it even becomes negative. For the regressions presented in the other columns, and for subsequent regressions, we retained *per capita* FDI as the main measure of FDI.

In column 4 of Table 8, we use the control variables described above and observe that the positive impact of FDI on welfare remains significant at a 1% confidence level. In column 5, we use the lag of *per capita* FDI, and the result remains the same; that is, FDI positively impacts HDI. As the relationship between welfare and the flow of FDI can be non-linear, we run the same regressions using *FDIPOP* and *FDIPOP* square (*FDIPOP*²). The regression result in column 6 indicates that the explanatory power of *FDIPOP* found in the previous regressions is split between the two variables, both of whose coefficients are non-significant.

Our regressions also confirm our expectations of the sign of the control variables. That is to say that a country's debt burden (*DEBTGDP*) has a negative impact on welfare. As we argued earlier, the higher a country's indebtedness, the more likely the country is to experience financial distress as a result of its debt servicing obligations, and the harder it is for the government to access financial resources for social spending.

The impact on welfare of macroeconomic instability (*INFLATION*) and the size of the government (*GOVSPEND*) appear to be non-significant. Infrastructure, however (measured by the log of *PHONE*, the number of fixed and mobile phones per 100 inhabitants), has a significantly positive impact on welfare. This can be explained by the fact that new infrastructure improves the standard of living and contributes to the overall sense of well-being. Furthermore, it was determined that openness to trade has a positive impact on welfare while *CREDIT* has a negative impact.

For business environments, institutional quality, and political risk effects, we observe that civil liberty (*CIVILLIB*) has a significantly negative impact on welfare. The *CIVILLIB* indicator awards high scores to countries where residents are less free and low scores to countries with freer environments. Therefore, civil liberty's negative impact on welfare is consistent with our expectation that greater freedom contributes to well-being. As shown in Table 6 and discussed earlier, civil liberty, political rights (*POLRIGHTS*), the corruption perceptions index (*CPI*), and the rule of law index (*LAW*) are highly correlated. Each measures institutional quality to some extent, as a better judicial system goes hand-in-hand with less corruption, stronger individual rights, and democracy. In the panel regressions, we did not use Corruption (*CPI*) or rule of law (*LAW*) because the data for these variables were less accessible.

To correct for a potential problem of endogeneity between FDI and HDI, we performed a two-stage least squares (2SLS) estimation of our model. Presented in the last column of Table 8, the results suggest that the value, sign, and significance level of the coefficients are more or less the same. This confirms the significantly positive relationship between HDI and *per capita* FDI in Africa.

To check robustness further, we ran cross-sectional regressions calculating the average value of each variable for each country during the period of study. We thus obtained one data per country for each variable. Next, we ran ordinary least squares (OLS) cross-sectional regressions with White's correction of heteroskedasticity using all countries. The results

Table 6. Correlation matrix for African countries from 1990 to 2007

	HDI	GDPPOP	FDIPOP	FDIGDP	FDIGCF	DEBTGDP	GOVSPEND	INFLATION	PHONE	INTERNET	ROAD	EDUCATION	OPENNESS	MKTCAP	CREDIT	LAW	CPI	POLRIGHTS	CIVILLIB
HDI	1.00																		
GDPPOP	0.67	1.00																	
FDIPOP	0.24	0.41	1.00																
FDIGDP	0.10	0.04	0.39	1.00															
FDIGCF	-0.02	0.17	0.64	1.00	0.64														
DEBTGDP	-0.26	-0.24	-0.09	0.03	0.33	1.00													
GOVSPEND	0.14	0.16	-0.03	0.03	-0.02	-0.18	1.00												
INFLATION	-0.08	-0.04	-0.01	0.01	0.00	-0.04	-0.04	1.00											
PHONE	0.56	0.63	0.27	0.03	0.06	-0.19	0.11	0.12	1.00										
INTERNET	0.49	0.51	0.19	0.01	0.06	-0.19	0.11	0.12	0.83	1.00									
ROAD	0.65	0.44	0.29	-0.02	0.01	-0.10	0.12	0.42	0.50	0.42	1.00								
EDUCATION	0.80	0.60	0.20	0.13	0.04	-0.24	0.09	0.42	0.51	0.42	0.53	1.00							
OPENNESS	0.44	0.45	0.37	0.39	0.19	-0.09	0.33	0.26	0.36	0.26	0.40	0.40	1.00						
MKTCAP	0.38	0.44	0.09	-0.12	-0.12	-0.30	0.09	0.01	0.31	0.01	0.44	-0.21	1.00						
CREDIT	0.47	0.34	0.00	-0.10	-0.13	-0.27	0.25	0.40	0.48	0.40	0.41	0.06	0.80	1.00					
LAW	0.57	0.46	0.00	-0.07	-0.15	-0.39	0.29	0.60	0.38	0.38	0.60	0.21	0.54	1.00					
CPI	0.61	0.60	0.00	-0.15	-0.21	-0.28	0.35	0.44	0.46	0.32	0.44	0.20	0.31	0.60	1.00				
POLRIGHTS	-0.24	-0.22	0.05	0.07	0.08	0.12	-0.06	-0.24	-0.24	-0.24	-0.26	-0.23	-0.12	-0.26	-0.30	1.00			
CIVILLIB	-0.27	-0.30	0.04	0.11	0.09	0.19	-0.09	-0.31	-0.29	-0.29	-0.26	-0.16	-0.16	-0.29	-0.30	-0.69	1.00		

Note: For an explanation of abbreviations, see Table 2.

presented in Table 9 confirm our previous finding that FDI has a significantly positive impact on welfare. The increase of the R^2 value after the incremental introduction of control variables suggests that these variables are also key determinants of welfare. This especially holds for the infrastructure variable. *LAW* and *CPI* have a significantly positive impact on welfare, which means that a better judiciary system improves the business environment and better protects investors, thereby facilitating investments and business development, which, in turn, create jobs and improve standards of living. That the coefficients of *OPENNESS* and *CREDIT* are not significant is not worrisome because, in general, the literature finds these variables to be among the determinants of FDI. Using these variables together with FDI could thus spread the explanatory power of the variables, which we presume has been the case.

Furthermore, in this cross-sectional regression, when we use *FDIPOP* and *FDIPOP*² together, the result remains the same, that is, *FDIPOP* has a significantly positive impact on HDI even though the non-linear relationship seems to be confirmed by the sign of *FDIPOP*², which is negative and significant. This probably explains why, in the panel regressions of Table 8, the explanatory power of FDI was split between *FDIPOP* and *FDIPOP*².

We run the same panel and cross-sectional regressions using the alternative welfare measure, real *per capita* GDP. The results presented in Table 10 indicate that the impact of *per capita* FDI on welfare measured by real *per capita* GDP is positive and significant in both panel and cross-sectional regressions. Here, however, *CREDIT* has a significant positive impact on *per capita* GDP in the panel regressions in contrast to the cross-sectional regressions where its impact is negative and non-significant. *EDUCATION* has a non-significant impact on welfare in all regressions. Here, when we run a 2SLS estimation to account for potential endogeneity, the results remain largely the same.

In sum, our results for both panel and cross-sectional regressions support the hypothesis of a significantly positive impact of FDI on welfare. In other words, FDI reduces poverty in African countries at the aggregate level. All else being equal, we observe that \$1.00 FDI *per capita* adds approximately 0.5 basis points to HDI and approximately 5 basis points to *per capita* GDP. The question that remains is whether this effect is uniform across regions.

(c) Impact of FDI on welfare across Africa

To address our second research question, whether FDI reduces poverty more in some African regions than in others, we run panel regressions using equation 1 for Africa's five free-trade areas.

(i) Impact of FDI in free-trade areas

Table 11 presents the regression results for Africa's five free-trade areas. In the ECCAS and IGAD regions, FDI contributes positively to welfare. This result is stronger with a lag of *FDIPOP* even when control variables are added. In these two regions, the sign of the coefficient estimates for FDI is in line with those of Africa, in general, and supports the hypothesis of FDI's positive impact on welfare. In the AMU, ECOWAS, and SADC regions, *per capita* FDI does not significantly impact welfare. In the SADC region, when we exclude South Africa (the most developed economy in the region) and/or Zimbabwe (which has experienced a high inflationary macroeconomic regime in recent years), the results remain more or less the same. Thus, FDI does not positively

Table 7. Granger causality test between welfare and per capita FDI

	Levin, Lin, and Chu (2002) test	Im, Pesaran, and Shin (2003) test
<i>Panel A: Stationarity test</i>		
HDI	-10.376 ***	-3.881 ***
FDIPOP	-11.319 ***	-4.364 ***
Log(GDPPOP)	-7.965 ***	-2.062 **
<i>Panel B: Causality between per capita FDI and HDI</i>		
Null hypothesis (test with 3 lags)	Homogeneous non-causality (HNC) <i>F</i> stat	Homogeneous causality (HC) <i>F</i> stat
Per capita FDI does not Granger-cause HDI	3.50 ***	0.942
HDI does not Granger-cause per capita FDI	0.93	
<i>Panel C: Causality between per capita FDI and real per capita GDP</i>		
Per capita FDI does not Granger-cause Log(real per capita GDP)	4.91 ***	1.85 ***
Log(real per capita GDP) does not Granger-cause per capita FDI	1.87 ***	0.79

Notes: FDIPOP, per capita foreign direct investment; HDI, Human Development Index; log(GDPPOP), log of real per capita gross domestic product. For both tests, a significant result rejects the null hypothesis of unit root or non stationarity at a 1% (***) or 5% (**) level of significance.

FDI, foreign direct investment; GDP, gross domestic product.

*** Level of significance = 1%.

Table 8. Panel Regression Results for the Impact of FDI on HDI for Africa with Controls, 1990–2007

	1	2	3	4	5	6	2SLS
INTERCEPT	0.3797127*** (13.70)	0.3812882*** (13.69)	0.3847671*** (13.79)	0.5076552*** (15.37)	0.521842*** (12.09)	0.5011838*** (14.13)	0.6865746 *** (8.73)
FDIPOP	0.0000483*** (3.90)			0.0000517*** (4.57)		-3.12e-06 (-0.07)	0.0000506*** (4.06)
FDIPOP ²						1.78e-08 (1.34)	
LAG(FDIPOP)					0.0000593*** (4.38)		
FDIGDP		-0.0053546 (-0.17)					
FDIGCF			-0.0012013 (-0.07)				
DEBTGDP				-0.0167139** (-2.27)	-0.0177087** (-2.37)	-0.0164891- ** (-2.21)	-0.0189942*** (-2.76)
GOVSPEND				0.0903428 (1.10)	0.0791476 (0.97)	0.0886461 (1.06)	0.0875407 (1.19)
INFLATION				0.0000267 (0.20)	-0.0000602 (-0.45)	0.0000186 (0.14)	-0.0000294 (-0.19)
LGPHONE				0.0205044*** (2.78)	0.0173948** (2.35)	0.0202649*** (2.73)	0.0125354** (2.06)
CIVILLIB				-0.0055453 (-1.54)	-0.0054914 (-1.49)	-0.0053531 (-1.47)	-0.0032297 (-1.08)
OPENNESS				0.0390364** (2.38)	0.0470365*** (2.79)	0.0454298*** (2.61)	0.0309605* (1.78)
CREDIT				-0.0865626* (-1.78)	-0.0887814 (-1.54)	-0.0783118 (-1.64)	-0.0651943 (-1.20)
Year effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
NB Obs.	766	753	733	601	571	601	506
<i>F</i> -Stat	584.71***	147.48***	144.81***	168.33***	207.00***	210.17***	175.53***
<i>R</i> ²	0.0558	0.0100	0.0050	0.7145	0.7161	0.7147	0.7079
Adjusted <i>R</i> ²	0.0546	0.0087	0.0037	0.7106	0.7121	0.7104	

Notes: The last column uses the two-stage least squares (2SLS) estimation method where the instrumental variables are three lags of FDI per capita. Estimates are made by controlling for fixed effects. We use the Newey–West robust method to account for heteroskedasticity and autocorrelations. Newey–West standard errors are in parentheses. For an explanation of abbreviations, see Table 2.

*** 1% significance level.

** 5% significance level.

* 10% significance level.

Table 9. Cross-Sectional Regression Results for the Impact of FDI on HDI for Africa with Controls, 1990–2007

	1	2	3	4	5	6	7	8
<i>INTERCEPT</i>	0.3900236*** (19.26)	0.6214215*** (6.39)	0.5298724*** (13.63)	0.1580323** (2.31)	0.3914406*** (14.99)	0.3228662*** (3.95)	0.3173644*** (3.75)	0.46758*** (10.36)
<i>FDIPOP</i>	0.0017611*** (4.14)	0.0002362** (2.14)	0.0001987*** (2.84)	0.000203** (2.51)	0.0000701*** (3.67)	0.0000555** (2.22)	0.0002618 (1.59)	0.0003513** (2.47)
<i>FDIPOP</i> ²	-1.45e-06*** (-4.00)						-1.89e-07 (-1.34)	-2.70e-07** (-2.34)
<i>DEBTGDP</i>		-0.0353739* (-1.96)	-0.0102731 (-0.91)	-0.0222638** (-2.10)	-0.003734 (-0.37)	-0.0010078 (-0.11)	-0.0030028 (-0.31)	-0.0435163*** (-3.74)
<i>GOVSPEND</i>		0.1632499 (0.85)	0.0229036 (0.16)	0.0140367 (0.1)	-0.1168234 (-0.81)	-0.1157652 (-0.82)	-0.1509284 (-0.93)	-0.5783902** (-2.38)
<i>INFLATION</i>		0.0000286 (1.34)	0.0000808*** (4.16)	0.0000359** (2.62)	0.0000676*** (5.91)	0.0000667*** (4.00)	0.0000627*** (3.40)	0.0001539 (1.64)
<i>LGPPHONE</i>					0.1053663*** (15.10)	0.101326*** (10.21)	0.0985813*** (9.40)	0.0996837*** (9.94)
<i>LAW</i>			0.1523694*** (5.22)			0.0233092 (0.58)	0.0179318 (0.42)	
<i>CPI</i>				0.0990958*** (4.71)		0.005194 (0.32)	0.006867 (0.41)	
<i>CIVILLIB</i>		-0.0428103** (-2.12)				0.015741 (1.36)	0.0162402 (1.42)	
<i>OPENNESS</i>								0.0335782 (1.05)
<i>CREDIT</i>								0.0061515 (0.14)
NB Obs.	49	46	47	44	47	43	43	41
<i>R</i> ²	0.2869	0.3041	0.4898	0.5122	0.8724	0.8824	0.8850	0.9079
Adjusted <i>R</i> ²	0.2559	0.2171	0.4275	0.4481	0.8569	0.8547	0.8537	0.8848

Notes: We use aggregate data for African countries. For each country, the value assigned to the variable is the average value for the 1990–2007 period. All regressions are estimated with White's correction of heteroskedasticity. Student *t*-statistics are in parentheses. For an explanation of abbreviations, see Table 2.

*** 1% significance level.

** 5% significance level.

* 10% significance level.

and significantly impact welfare in the AMU, ECOWAS, and SADC regions.

To assess the robustness of these findings, we run the regressions in the free-trade RECs using real *per capita* GDP as an alternative welfare variable (Table 12). We observe regional differences in the relationship between FDI and *per capita* GDP. In all regions, FDI has a significantly positive impact on *per capita* GDP with the exception of ECOWAS where its impact is non-significant. In the AMU and SADC regions, the impact of FDI on welfare becomes positive and significant; however, this was not the case when HDI was used as the dependent variable. This finding has two implications. The first is that it can be misleading to use real *per capita* GDP to capture the relationship between FDI and welfare. The second is that the link between real *per capita* GDP and welfare is not as linear as one may think. This confirms the need to assess the impact of FDI on welfare directly.

To further investigate regional differences, we consider the following regression equation:

$$\begin{aligned} \text{Welfare} = & \alpha + \beta_1 \times \text{FDI} \times \text{Dummy}_{\text{ECCAS}} + \beta_2 \times \text{FDI} \\ & \times \text{Dummy}_{\text{ECOWAS}} + \beta_3 \times \text{FDI} \times \text{Dummy}_{\text{IGAD}} \\ & + \beta_4 \times \text{FDI} \times \text{Dummy}_{\text{SADC}} + \beta_5 \times \text{FDI} \\ & \times \text{Dummy}_{\text{AMU}} + \text{Control variables} \end{aligned} \quad (2)$$

where dummy variables represent Africa's five RECs: AMU, ECCAS, ECOWAS, IGAD, and SADC. The dummy for an

REC takes a value of one when the country belongs to that REC and zero when the country does not. To avoid redundancy, we dropped Angola and the Democratic Republic of the Congo from the calculations for SADC but kept them in the calculations for ECCAS.

Table 13 presents the regression results and shows that the coefficient for the ECCAS dummy times *FDIPOP* is positive and significant. This confirms that, in this region, FDI positively impacts welfare. The same holds true for the IGAD and ECOWAS regions. For the SADC dummy times FDI, when HDI is used as the dependent welfare variable, the FDI coefficient is negative and significant in most regressions. For the AMU dummy times FDI, the coefficient is not significant in any regression where HDI is the dependent welfare variable. Thus, when HDI is used as the dependent welfare variable, FDI appears to positively impact welfare in ECCAS, ECOWAS, and IGAD, negatively impact welfare in SADC, and not impact welfare in AMU. When real *per capita* GDP is used as a welfare variable, as is the practice in most studies of this genre, FDI appears to have a positive impact on *per capita* GDP in every region. Alternatively, the findings in Table 13 would serve better as confirmation of the results presented in Tables 11 and 12.

(ii) Impact of FDI in customs and monetary unions

Table 14 presents the results of the panel regressions for Africa's five customs and monetary unions. In this regional analysis, CEMAC is a subgroup of ECCAS, EAC is a

Table 10. Panel and cross-sectional regression results for the impact of FDI on real per capita GDP for Africa with controls, 1990–2007

	1	2	3	4	5	6	2SLS	OLS1	OLS2	OLS3
<i>INTERCEPT</i>	6.601532*** (99.67)	6.579636*** (85.01)	6.962323 *** (39.50)	6.632219*** (32.47)	6.63076*** (31.76)	6.28459*** (32.96)	6.652937*** (32.89)	6.295567*** (43.63)	6.980336*** (12.29)	6.97921*** (11.72)
<i>FDIPOP</i>	0.000543*** (7.44)			0.0004485*** (6.50)	0.0003796 (1.59)		0.0005908*** (5.91)	0.0017238** (2.01)	0.0009222** (2.05)	0.0008871 (0.19)
<i>FDIPOP</i> ²					2.17e−08 (0.27)					3.09e−08 (0.01)
<i>LAG(FDIPOP)</i>						0.000539*** (5.43)				
<i>FDIGDP</i>		0.1381655 (0.52)								
<i>FDIGCF</i>			−0.0324908 (−1.64)							
<i>DEBTGDP</i>				−0.1750949*** (−4.33)	−0.1751497*** (−4.31)	−0.179895*** (−4.66)	−0.1705014*** (−3.97)		−0.4618371*** (−4.11)	−0.4617021*** (−3.85)
<i>GOVSPEND</i>				−1.046171*** (−2.85)	−1.050589*** (−2.87)	−1.13809** (−2.80)	−0.8650574 *** (−3.21)		−2.756218 (−1.34)	−2.742107 (−1.22)
<i>INFLATION</i>				0.0011223** (2.03)	0.0011183** (2.02)	0.0008756 (1.61)	0.0009539 (1.28)		0.0021272 (0.79)	0.002123 (0.77)
<i>LGPHONE</i>				0.099731*** (4.63)	0.0999815*** (4.41)	0.0922841*** (4.59)	0.0843977*** (4.22)		0.8902168*** (6.38)	0.8907281*** (5.60)
<i>CIVILLIB</i>				−0.0176583 (−1.14)	−0.0173726 (−1.33)	−0.0191168 (−1.42)	−0.011898 (−0.98)		0.1234191 (1.61)	0.1232945 (1.59)
<i>EDUCATION</i>				0.0025778 (1.32)	0.0024721 (1.38)	0.0021773 (1.20)	0.0025663 (1.24)		−0.010454 (−1.09)	−0.010463 (−1.08)
<i>OPENNESS</i>				0.0455004 (0.51)	0.0526402 (0.64)	0.1452268 (1.61)	−0.0781456 (−0.84)		−0.2880278 (−0.82)	−0.2871221 (−0.75)
<i>CREDIT</i>				0.6314599*** (4.32)	0.640168*** (4.43)	0.7527098*** (5.28)	0.6665291*** (3.90)		−0.9207409 (−0.82)	−0.9221877 (−0.79)
Year effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
Country effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
NB Obs.	757	741	721	515	515	483	419	45	39	39
<i>F</i> -Stat	1660.79***	1371.18***	1730.74***	617.55***	634.95***	693.14***	211.86***	4.04*	42.75***	14.58***
<i>R</i> ²	0.0928	0.0006	0.0044	0.6420	0.6423	0.6515	0.6672	0.1109	0.8903	0.8903
Adjusted <i>R</i> ²	0.0916	−0.0008	0.0030	0.6357	0.6352	0.6446		0.0902	0.8563	0.8511

Notes: We use panel and cross-sectional data where available. We use log of real *per capita* GDP to measure welfare. Panel estimates are made by controlling for fixed effects. For the two-stage least squares (2SLS) estimation method, our instrumental variables are three lags of FDI *per capita*. We use the Newey–West robust method to account for heteroskedasticity and autocorrelations in the panel regressions. Newey–West standard errors are in parentheses. For the ordinary least squares (OLS) regressions, estimates are made with White’s correction of heteroskedasticity. Student *t*-statistics are in parentheses. For an explanation of abbreviations, see Table 2.

*** 1% significance level.

** 5% significance level.

* 10% significance level.

Table 11. Panel regression results of the impact of FDI on HDI in African free-trade areas with controls, 1990–2007

	ECCAS		ECOWAS		IGAD		SADC		AMU + Egypt	
	1	2	1	2	1	2	1	2	1	2
<i>INTERCEPT</i>	0.644635*** (5.87)	0.53937*** (7.95)	0.2467117*** (11.89)	0.3974537*** (9.45)	0.2892055*** (4.36)	0.0698207 (0.85)	0.3354632*** (2.97)	0.2266863*** (2.94)	0.4676763*** (2.78)	0.2795132 (1.41)
<i>FDIPOP</i>	0.0000324** (2.08)		-0.000153 (-1.34)		0.0011656* (1.85)		2.17e-06 (0.07)		-0.0001549 (-0.84)	
<i>LAG(FDIPOP)</i>		0.0000559*** (4.47)		-0.0003703 (-1.24)		0.0020245** (2.04)		-0.0000817 (-1.56)		-0.0004437 (-1.05)
<i>DEBTGDP</i>	-0.0309653* (-1.63)	-0.0212477 (-1.31)	0.0236377** (2.21)	-0.0578877*** (-3.43)	-0.0090516 (-0.59)	0.0005528 (0.04)	-0.0423541*** (-3.09)	-0.042516*** (-3.42)	-0.0347091 (-0.50)	-0.0651068 (-0.86)
<i>GOVSPEND</i>	-0.2100371* (-1.76)	-0.1850681 (-1.62)	-0.0886004 (-1.16)	-0.237607* (-1.86)	-0.5758209** (-2.36)	-0.6025137** (-2.13)	0.3180379** (2.12)	0.2897227** (1.89)	0.0065581 (0.02)	0.3161407 (0.82)
<i>INFLATION</i>	-0.0003204 (-0.88)	-0.0007478** (-2.30)	0.0000995 (0.76)	0.0001255 (0.41)	0.000209 (0.73)	0.0000458 (0.16)	0.0001684 (1.01)	0.0000723 (0.51)	0.0023242 (1.03)	0.002772 (1.22)
<i>LGPHONE</i>	0.0187948 (1.03)	0.0123895 (0.72)	-0.0072898 (-1.20)	-0.0252379*** (-2.94)	0.0488144*** (4.26)	0.0431595*** (3.65)	-0.0281857* (-1.95)	-0.0358997** (-2.49)	0.0351656 (1.29)	0.0164772 (0.60)
<i>CIVILLIB</i>	-0.0310268*** (-3.86)	-0.0306897*** (-4.41)	-0.0050417* (-1.62)	-0.0025987 (-0.56)	0.0339502*** (4.07)	0.0330555*** (3.78)	-0.0052438 (-0.59)	-0.006795 (-0.90)	-0.0122606 (-0.64)	-0.0014111 (-0.06)
<i>OPENNESS</i>	0.0378499** (2.21)	0.0488424*** (3.21)	-0.0242108 (-1.30)	0.1102142*** (3.31)	-0.0251435 (-0.26)	-0.1028219 (-1.09)	0.0456945* (1.91)	0.0713589*** (2.76)	0.2479968 (1.14)	0.2965599 (1.36)
<i>CREDIT</i>	0.136993 (0.91)	-0.0784811 (-0.59)	0.1898389*** (2.73)	0.4618876*** (4.55)	0.4719278** (2.15)	0.5673519** (2.66)	-0.1749525** (-2.33)	-0.202293*** (-2.85)	-0.1785201* (-1.92)	-0.260244* (-1.90)
Year effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
NB Obs.	109	103	190	181	68	64	171	164	63	59
<i>F-Stat</i>	110.38***	101.03***	282.91***	138.33***	88.31***	91.95***	138.87***	110.34***	70.84***	60.93***
<i>R</i> ²	0.8217	0.8103	0.7330	0.7284	0.7735	0.7670	0.7630	0.7747	0.7652	0.7670
Adjusted <i>R</i> ²	0.8074	0.7919	0.7213	0.7157	0.7428	0.7362	0.7513	0.7631	0.7304	0.7298

Notes: We use country-year data where available. Estimates are made by controlling for fixed effects. We use the Newey–West robust method to account for heteroskedasticity and autocorrelations. Newey–West standard errors are in parentheses. For an explanation of abbreviations, see Tables 2 and 3.

*** 1% significance level.

** 5% significance level.

* 10% significance level.

Table 12. Panel regression results of the impact of FDI on real per capita GDP in African free-trade areas with controls, 1990–2007

	ECCAS		ECOWAS		IGAD		SADC		AMU	
	1	2	1	2	1	2	1	2	1	2
<i>INTERCEPT</i>	6.784747*** (13.62)	9.066062*** (15.17)	6.229827*** (47.97)	5.974344*** (41.18)	5.113264*** (33.31)	5.092943*** (27.63)	5.878023*** (22.87)	6.711536*** (18.84)	7.314021*** (30.83)	7.584928*** (33.74)
<i>FDIPOP</i>	0.0002246** (2.65)		0.0005344 (1.27)		0.0028692* (1.84)		0.0001259** (1.81)		0.000327* (1.71)	
<i>LAG(FDIPOP)</i>		0.0010623** (2.47)		0.0000809 (0.20)		0.0033635 (1.39)		0.0003231** (2.61)		0.0006192* (1.96)
<i>DEBTGDP</i>	−0.533598*** (−5.52)	−0.6513139*** (−7.33)	−0.0084178 (−0.16)	−0.0197658 (−0.35)	−0.0527721** (−2.07)	−0.0521479* (−1.85)	−0.0729307** (−2.26)	−0.082177** (−2.34)	0.217036*** (4.84)	0.2039013*** (3.90)
<i>GOVSPEND</i>	−1.556223** (−2.57)	−1.579505** (−2.31)	−0.4550964 (−1.30)	−0.3993601 (−1.11)	0.2317648 (0.42)	0.4562603 (0.74)	0.1783608 (0.77)	0.1549835 (0.62)	−1.102147*** (−3.07)	−1.341474*** (−3.19)
<i>INFLATION</i>	0.0005649 (0.34)	−0.0030515 (−1.46)	0.0028398*** (3.54)	0.0027172*** (3.08)	−0.0006546 (−0.91)	−0.0012739** (−2.25)	0.0006045 (1.41)	0.0005629 (1.09)	−0.0002515 (−0.26)	6.49e−06 (0.01)
<i>LGPLPHONE</i>	0.1581064* (1.77)	−0.0030213 (−0.07)	0.1264714*** (4.71)	0.1223983*** (3.95)	0.1281591*** (2.98)	0.084417** (2.68)	0.1282804*** (4.82)	0.1106738*** (3.83)	−0.02733 (−1.07)	−0.0109842 (−0.43)
<i>CIVILLIB</i>	−0.1199033*** (−2.85)	−0.1106336*** (−2.69)	−0.0040626 (−0.37)	0.0027244 (0.21)	0.0579297*** (3.10)	0.0584092** (2.39)	−0.0142106 (−0.82)	−0.0124473 (−0.73)	0.0445872** (2.59)	0.0429188*** (2.92)
<i>EDUCATION</i>	0.0052713 (0.80)	0.0023085 (0.33)	−0.0050263* (−1.98)	−0.0056587* (−1.88)	0.0040927** (2.29)	0.0053833** (2.60)	0.0019752 (1.16)	.0019897 (0.99)	0.0033946 (1.12)	0.0040562 (1.52)
<i>OPENNESS</i>	−0.0054607 (−0.03)	0.3123003** (2.14)	−0.194955** (−2.37)	−0.2395511*** (−2.80)	0.1435325 (0.42)	−0.2926111 (−1.35)	−0.1612097*** (−2.70)	−0.1074796* (−1.77)	−0.0150645*** (−0.08)	0.0114641 (0.08)
<i>CREDIT</i>	0.7350938 (1.65)	0.4237183 (0.76)	1.393202*** (7.51)	1.537816*** (7.31)	0.2189839 (0.61)	0.4039052 (1.30)	0.6199975*** (4.03)	0.6103216*** (3.65)	0.4079926*** (5.86)	0.2955831*** (3.21)
Year effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
NB Obs.	96	82	169	159	54	50	140	133	56	52
<i>F</i> -Stat	330.45***	142.61***	428.24***	297.04***	209.70***	449.56***	1767.85***	952.43***	945.14***	2515.60***
<i>R</i> ²	0.9063	0.9351	0.7179	0.7315	0.8757	0.8788	0.8645	0.8720	0.9598	0.9658
Adjusted <i>R</i> ²	0.8965	0.9270	0.7000	0.7153	0.8503	0.8515	0.8551	0.8626	0.9519	0.9585

Notes: We use country-year data where available. Estimates are made by controlling for fixed effects. We use the Log of real per capita GDP to measure welfare. We use the Newey–West robust method to account for heteroskedasticity and autocorrelations. Newey–West standard errors are in parentheses. For an explanation of abbreviations, see Tables 2 and 3.

*** 1% significance level.

** 5% significance level.

* 10% significance level.

Table 13. Panel regression results for the impact of FDI on welfare in African regions with controls, 1990–2007

	HDI			Real per capita GDP		
	1	2	3	1	2	3
<i>INTERCEPT</i>	0.2952867*** (14.78)	0.3237632*** (6.71)	0.6564559*** (11.03)	6.727606*** (111.09)	6.908142*** (70.70)	6.659313*** (33.77)
<i>AMU * FDIPOP</i>	0.0000409 (0.41)	0.0000555 (0.53)	0.0000503 (0.61)	0.0010222*** (3.69)	0.0014046*** (4.44)	0.001087*** (4.58)
<i>ECCAS * FDIPOP</i>	0.0000623*** (5.34)	0.0000599*** (5.06)	0.0000685*** (6.45)	0.000573*** (7.71)	0.0004646*** (8.33)	0.000477*** (6.08)
<i>ECOWAS * FDIPOP</i>	0.0003035*** (3.09)	0.0003029** (2.56)	0.0004525*** (3.13)	0.0022158*** (2.97)	0.0020622*** (4.31)	0.0012738*** (2.63)
<i>IGAD * FDIPOP</i>	0.0009697*** (2.94)	0.0012042*** (2.69)	0.0017064*** (3.40)	0.0029619 (1.52)	0.0032791*** (2.92)	0.0071536*** (4.10)
<i>SADC * FDIPOP</i>	-0.0001094* (-1.92)	-0.0001009* (-1.71)	-0.000088 (-1.64)	0.0001126 (1.08)	0.0002989*** (4.34)	0.0001187 (1.49)
<i>DEBTGDP</i>		-0.0009061 (-0.12)	-0.0066848 (-0.92)		-0.1843647*** (-4.4)	-0.1422133*** (-3.45)
<i>GOVSPEND</i>		-0.050098 (-0.62)	0.0381163 (0.47)		-0.3705004 (-1.24)	-1.254493*** (-3.70)
<i>INFLATION</i>		-5.25e-06 (-0.28)	0.0000857 (0.64)		0.000231*** (2.69)	0.0012344** (2.58)
<i>LGPPHONE</i>		0.0076802 (1.02)	0.0145808** (2.02)		0.109013*** (4.97)	0.0867929*** (4.43)
<i>CIVILLIB</i>		-0.005237 (-1.46)	-0.0062657* (-1.85)		-0.0194041** (-2.22)	-0.0186222 (-1.65)
<i>EDUCATION</i>						0.0025838 (1.47)
<i>OPENNESS</i>			0.0482974*** (3.37)			0.0452104 (0.55)
<i>CREDIT</i>			-0.0647284 (-1.36)			0.6533425*** (5.34)
Year effect	Yes	Yes	Yes	Yes	Yes	Yes
Country effect	Yes	Yes	Yes	Yes	Yes	Yes
NB Obs.	766	686	601	757	684	515
<i>F-Stat</i>	399.47***	172.65***	170.71***	1262.44***	1743.06***	979.49***
<i>R</i> ²	0.1923	0.6695	0.7186	0.1967	0.5886	0.6481
Adjusted <i>R</i> ²	0.1870	0.6646	0.7129	0.1913	0.5825	0.6411

Notes: We use panel data where available. For the regression with real *per capita* GDP as welfare variable, we use the Log of real *per capita* GDP. Estimates are made by controlling for fixed effects. We use the Newey–West robust method to account for heteroskedasticity and autocorrelations. Newey–West standard errors are in parentheses. ECCAS, ECOWAS, IGAD, SADC, and AMU are dummy variables for the regions where the value of 1 is assigned if the country belongs to the region and the value of zero is assigned if the country does not. To avoid overlap, SADC excludes Angola and the Democratic Republic of the Congo (these countries are part of ECCAS). For an explanation of abbreviations, see Tables 2 and 3. When we run the same regressions using lag of *FDIPOP* and *FDIPOP*², the results (unreported) confirm our conclusions.

*** 1% significance level.

** 5% significance level.

* 10% significance level.

subgroup of ECCAS and IGAD (except Tanzania, which belongs to SADC), SACU is a subgroup of SADC, and WAEMU and WAMZ are subgroups of ECOWAS. We expect these advanced economic subgroups to confirm the regional differences observed in the larger RECs. Among these subgroups, CEMAC and WAEMU share a currency (the CFA franc, which is pegged to the euro). Thus, economic convergence between CEMAC and WAEMU member countries is likely to take place earlier than convergence between ECCAS and ECOWAS member countries that are not also members of CEMAC and WAEMU.

The results shown in Table 14 indicate that FDI has a strong positive impact on welfare in the CEMAC and EAC regions. This echoes our findings for ECCAS and IGAD. In the SACU region, the impact of FDI on welfare is not significant; the same is true for the entire SADC region. In the WAEMU region, FDI again has a negative impact on welfare. The impact

is not significant when we use current *FDIPOP* but is significant when we use lag of *FDIPOP*. The impact is positive but not significant in the WAMZ region.

Overall, we can conclude that the impact of *per capita* FDI on welfare varies from region to region with substantial differences between regions. FDI positively impacts welfare in Central and Eastern Africa but does not have a significant impact in Northern and Southern Africa though it has mixed results in Western Africa. The fact that Central and Eastern Africa are poorer than Northern and Southern Africa means that FDI impacts welfare more strongly in poorer countries. This has been found to be true in Eastern Europe as well (Brenton, Di Mauro, & Lücke, 1998; Buch, Kokta, and Piazzolo, 2001).

(iii) Income level differences

To further investigate income level differences, we consider the following regression equation:

Table 14. Panel regression results of the impact of FDI on HDI in African custom unions with controls, 1990–2007

	CEMAC		EAC		SACU		WAEMU		WAMZ	
	1	2	1	2	1	2	1	2	1	2
<i>INTERCEPT</i>	0.4829258*** (7.25)	0.5696803*** (8.50)	-0.0118659 (-0.15)	0.116675 (1.68)	0.3679339** (2.52)	0.2999829** (2.44)	0.2244786*** (5.87)	0.3199548*** (6.76)	0.3775419*** (7.72)	0.4622624*** (10.73)
<i>FDIPOP</i>	0.0000326** (2.33)		0.0061543*** (3.18)		0.000087 (0.69)		-0.0006653 (-1.14)		0.0009034 (1.12)	
<i>LAG(FDIPOP)</i>		0.0000532*** (4.54)		0.0053877** (2.57)		0.0000487 (0.39)		-0.0017175*** (-2.95)		0.0001806 (0.28)
<i>DEBTGDP</i>	-0.0170491 (-0.91)	-0.0126644 (-0.71)	0.0080243 (0.29)	0.0178474 (0.47)	-0.1729314 (-1.21)	-0.1473066 (-1.22)	0.0167282 (1.10)	0.0171676 (1.22)	-0.0116946 (-1.37)	-0.0134177* (-1.73)
<i>GOVSPEND</i>	-0.399525*** (-2.84)	-0.3528616** (-2.61)	0.1292004 (0.78)	0.0731346 (0.31)	1.021811** (2.68)	1.027593** (2.59)	-0.0140595 (-0.12)	-0.1439606 (-1.30)	-0.0911829 (-1.15)	-0.0887802 (-1.12)
<i>INFLATION</i>	-0.000553 (-1.12)	-0.0010048** (-2.49)	-0.0001477 (-0.23)	-0.0006906 (-1.19)	0.0028416 (1.07)	0.0028648 (1.07)	0.0002472 (0.69)	-0.0000602 (-0.20)	-0.0001241 (-1.50)	-0.0000949 (-1.11)
<i>LGPPHONE</i>	0.0284657 (1.54)	0.0217774 (1.28)	0.0017335 (0.10)	0.0038739 (0.19)	-0.0550016** (-2.11)	-0.0594373** (-2.18)	0.0013119 (0.14)	0.0107745 (1.10)	0.0041094 (0.28)	0.0075872 (0.61)
<i>CIVILLIB</i>	-0.0272484** (-2.53)	-0.0268197** (-2.57)	0.0376054*** (3.86)	0.0390461*** (4.02)	0.0215703 (0.75)	-0.0043054 (-0.15)	-0.0110111*** (-2.78)	-0.0117542*** (-2.95)	-0.0009385 (-0.33)	0.0003309 (0.14)
<i>OPENNESS</i>	0.0243343 (1.53)	0.0361993** (2.09)	0.0655482 (0.78)	0.0367966 (0.35)	0.0798466 (0.93)	0.0745657 (1.09)	0.0318333 (0.67)	0.0549184 (1.12)	0.0530787 (1.52)	0.0407205 (1.22)
<i>CREDIT</i>	0.2987141 (1.52)	0.0457257 (0.24)	-0.0490334 (-0.22)	-0.0820921 (-0.30)	-0.1899031 (-1.33)	-0.1428202 (-1.08)	0.3322803*** (3.12)	0.3179986*** (2.99)	0.1268312 (0.68)	0.1130872 (0.65)
Year effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
NB Obs.	80	76	74	70	53	51	128	122	46	43
<i>F</i> -Stat	115.07***	213.19***	108.92***	82.80	63.37***	18.88	159.05***	146.78***	610.83***	6678.29***
<i>R</i> ²	0.8471	0.8496	0.7587	0.7704	0.6395	0.6591	0.6197	0.6253	0.8371	0.8430
Adjusted <i>R</i> ²	0.8299	0.8317	0.7290	0.7403	0.5740	0.5941	0.5942	0.5987	0.8019	0.8060

Notes: We use country-year data where available. Estimates are made by controlling for fixed effects. We use the Newey–West robust method to account for heteroskedasticity and autocorrelations. Newey–West standard errors are in parentheses. For an explanation of abbreviations, see Tables 2 and 3.

*** 1% significance level.

** 5% significance level.

* 10% significance level.

Table 15. Panel regression results for the impact of FDI on welfare in Africa low and middle income countries with controls, 1990–2007

	HDI			Real per capita GDP		
	1	2	3	1	2	3
<i>INTERCEPT</i>	0.1952152*** (21.28)	0.3170821*** (10.25)	0.6559455*** (18.18)	5.911773*** (23.61)	6.139212*** (39.26)	7.260904*** (32.79)
<i>LIC * FDIPOP</i>	0.0000685*** (4.42)	0.0000594*** (4.39)	0.0000605*** (5.61)	0.0006122*** (5.53)	0.0004757*** (6.12)	0.0005192*** (5.43)
<i>MIC * FDIPOP</i>	0.0000452*** (3.49)	0.0000399*** (2.99)	0.0000434** (2.14)	0.0005264*** (7.25)	0.0004266*** (7.65)	0.0004104*** (4.31)
<i>DEBTGDP</i>		-0.0102085 (-1.34)	-0.016445** (-2.24)		-0.1581512*** (-5.18)	-0.1799628*** (-4.30)
<i>GOVSPEND</i>		-0.0193246 (-0.24)	0.0912984 (1.12)		-0.6815633** (-2.25)	-1.02704*** (-2.75)
<i>INFLATION</i>		3.62e-06 (0.19)	0.0000328 (0.25)		-0.0000473 (-0.90)	0.0014583** (2.41)
<i>LGPHONE</i>		0.0111663 (1.46)	0.0200251*** (2.71)		0.0995034*** (5.04)	0.034138** (2.55)
<i>CIVILLIB</i>		-0.0046747 (-1.26)	-0.005476 (-1.52)		-0.0234883** (-2.5)	-0.016376 (-1.30)
<i>EDUCATION</i>						0.0017883 (0.86)
<i>OPENNESS</i>			0.038865** (2.41)			0.0122453 (0.13)
<i>CREDIT</i>			-0.0846226 (-1.74)			0.5958984*** (4.58)
Year effect	Yes	Yes	Yes	Yes	Yes	Yes
Country effect	Yes	Yes	Yes	Yes	Yes	Yes
NB Obs.	766	686	601	757	684	515
<i>F-tat</i>	207.56***	187.73***	164.89***	982.46***	5423.46***	651.08***
<i>R</i> ²	0.0573	0.6597	0.7152	0.0953	0.5745	0.6430
Adjusted <i>R</i> ²	0.0549	0.6561	0.7108	0.0929	0.5701	0.6359

Notes: We use panel data where available. For the regression with real *per capita* GDP as welfare variable, we use the Log of real *per capita* GDP. Estimates are made by controlling for fixed effects. We use the Newey–West robust method to account for heteroskedasticity and autocorrelations. Newey–West standard errors are in parentheses. *LIC* and *MIC* are dummy variables for the income level of the countries, respectively, low income and middle income. For *LIC* (*MIC*), the value of 1 is assigned if the country is a low (middle) income country in the given year, and the value of zero is assigned if the country is not. For an explanation of abbreviations, see Tables 2 and 3. When we run the same regressions using lag of *FDIPOP* and *FDIPOP*², the results (unreported) confirm our conclusions.

*** 1% significance level.

** 5% significance level.

$$\text{Welfare} = \alpha + \beta_1 \times \text{FDI} \times \text{Dummy}_{LIC} + \beta_2 \times \text{FDI} \times \text{Dummy}_{MIC} + \text{Control variables} \quad (3)$$

where dummy variables represent the income level classification of the World Bank: low income country, middle income country, and high income country. As no African country belongs to the group of high income countries, we only consider the low income group (designated by *LIC*) and the middle income group (designated by *MIC*). The dummy for an income level group takes a value of one when the country belongs to that income level and zero when the country does not. This classification is performed on a yearly basis because some countries can change income level over two consecutive years.

Table 15 presents the regression results and shows that the coefficient for the *LIC* dummy times *FDIPOP* is positive and significant. The same holds true for *MIC*. This confirms that, independent of the income level, FDI positively impacts welfare. However, in all regressions, the coefficient for *LIC* dummy times *FDIPOP* is higher than the coefficient for *MIC* dummy times *FDIPOP*. This supports our claim that FDI has more impact on welfare in poorer than in richer countries.

5. CONCLUSION AND POLICY RECOMMENDATIONS

This paper assesses the impact of FDI on welfare across African regions using the HDI and the real *per capita* GDP as welfare measures. To measure FDI, we used *per capita* FDI net inflows, FDI net inflows over GDP, and FDI net inflows over gross capital formation (*GCF*). As was done in other studies, we controlled for the phenomena that affect welfare and economic growth: economic and policy factors, the business environment and the quality of institutions, and political risks.

On this basis, we find a strongly positive relationship between FDI and welfare improvement at the level of Africa as a whole. This relationship holds even after we control for government size, country indebtedness, macroeconomic instability, infrastructure development, institutional quality, political risk, openness to trade, education, and financial market development. When we analyze the data for various African regions, however, we find that FDI's impact on welfare differs. Our results suggest that the poorer and less developed the host country, the greater the impact of FDI on poverty reduction. However, in absolute terms, richer countries may benefit more than poorer countries.

Two main policy recommendations can be drawn from our findings. First, in terms of reducing welfare differences between countries in the same region, regional policies to attract FDI should be carefully designed to direct those investments toward the most productive sectors of the economy, particularly for the less developed countries. Indeed, these investments will create jobs, develop local skills, and stimulate technological progress, thus reducing poverty and improving welfare in the whole region. Second, in terms of reducing inequalities within a country, enough incentives should be provided to encourage foreign investments into labor-intensive and pro-poor sectors,

such as agriculture, education, health, and infrastructure development. Of course, the political, social and economic context of host countries will influence the choices to be made in terms of incentive policies and sectors to be prioritized. Several methods exist to identify these priority sectors. One of them is the growth diagnostic framework that international development agencies have recently begun to implement. For this paper, unfortunately, due to data limitations, we do not use disaggregate data with enough detailed information on sectorial FDI and incentive policies to attract FDI. We leave these interesting and important issues for future research.

NOTES

1. For details, visit the MDG website at <http://www.un.org/millenniumgoals/>.
2. See for example the 7–13 February 2009 issue of *The Economist* on “The return of economic nationalism” (www.economist.com).
3. As computed by the UNDP.
4. HDI is more related to welfare, which is a larger concept than poverty. However, to link our paper with the MDGs and for ease of understanding, throughout the paper, we will use “poverty reduction” for “welfare”.
5. The poverty incidence measure is the poverty indicator from household surveys. There is an international poverty incidence estimated by the World Bank (PovNet). The accuracy of the data for this international poverty incidence has been challenged recently. For instance, the World Bank has reviewed the basis of the estimation in 2009, and following that review, the indicator data have changed drastically. Moreover, the data are not available for each year. Here, the poverty incidence refers to the one calculated from household surveys. This poverty incidence is more accurate but also has several drawbacks, such as availability and comparability across countries.
6. This is different from the initial studies on economic growth that had recognized that technological progress is the main driver of sustainable growth (Solow; 1956).
7. See Sumner (2005) for a detailed discussion of various channels.
8. This requires that profit repatriation and royalties be less than FDI inflows. In addition, the taxes paid by FDI must be higher than subsidies and fiscal relief (Sumner, 2005).
9. In their study, “quality” refers to the effect of a unit of FDI on economic growth.
10. For studies on the relationship between financial market development and economic growth in Africa, see for instance, Allen, Carletti, Cull, Qian, and Senbet (2010), Beck, Fuchs, and Uy (2009) and Senbet and Otchere (2010). For studies on the causality between financial market development and FDI, see for instance, Adam and Tweneboah (2009) and Al Nasser and Soydemir (2010).
11. Sharma and Gani’s measure for FDI is FDI net inflows as a percentage of GDP.
12. For details on how to calculate HDI, refer to the technical note of the Human Development Report available in UNDP (2010).
13. The technical notes at http://earthtrends.wri.org/searchable_db/variablenotes.php?varid=1280&theme=10 state that “The Rule of Law Index is a measure of ‘the extent to which agents have confidence in and abide by the rules of society.’ The degree to which a society’s atmosphere is conducive to regular, orderly social and economic activity and the protection of private property is an important measure of government effectiveness.”
14. Because HDI includes education, in order to avoid spurious regressions, we do not include education in the regressions in which HDI is used as a dependent variable.
15. We could also have used a synthetic index of infrastructure based on these three variables and factor analysis techniques.

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