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Léonce Ndikumana and Theresa Mannah Blankson

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Financing Domestic Investment in African Countries: Does the Source of Financing Matter?

Leonce Ndikumana[a] and Theresa Mannah Blankson[b]

University of Massachusetts at Amherst

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Abstract

This paper aims to investigate the effects of various sources of financing on domestic investment in African countries. Domestic savings and credit to the private sector prove to be the most robust sources of financing for domestic investment. While foreign direct investment also has a positive effect on domestic investment, the magnitude is relatively smaller. Official development aid, public external debt and migrant remittances have no statistically significant effect on domestic investment. The evidence has a powerful policy implication: in their efforts to boost domestic investment, African countries are should primarily look inward. Improving the environment for financial intermediation and domestic savings mobilization appears to be a more promising route for stimulating domestic investment than relying on imported investment capital.

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[a] Department of Economics and Political Economy Research Institute at the University of Massachusetts at Amherst.
[b] Department of Economics at University of Massachusetts at Amherst, and Bank of Ghana.

1. Introduction

A decade and a half ago, two prominent development economists charged that economists had "not yet found the key to growth in Africa" (Dollar & Easterly, 1999, p. 546). Specifically, these authors challenged what they referred to as the traditional aid-to-investment-to-growth linkages as not being robust in the particular case of African countries. They argued that in the case of African countries, "aid does not necessarily finance investment and investment does not necessarily promote growth" (Dollar & Easterly, 1999, p. 574). This conclusion casts doubt on a long tradition in the economics literature that posits an important role of foreign capital for domestic investment and growth. In his seminal work, Wassily Leontief argued that "a rise in the rate of growth of the underdeveloped areas would demand an increased volume of productive investment. The additional capital could be created through stepped up internal savings, or it might be obtained from abroad; that is, transferred in the form of aid, foreign loans, or direct private investment from the developed countries" (Leontief, 1965, p. 1039). This view has been the foundation of the development strategies that emphasize the role of foreign aid as a means of boosting investment to stimulate growth, which Dollar and Easterly sought to challenge.

Writing at the end of the 1990s, the economists' frustration was understandable. Africa was coming out of a decade of disappointing growth, despite series of painful economic reforms that had promised to help the continent turn the corner from the debt distress and stagnation endured in the 1980s which was eventually dubbed "the lost decade" (Bates, Coatsworth, & Williamson, 2007; Easterly & Levine, 1997). Since the turn of the century, however, the story of Africa's growth is more upbeat. Growth has accelerated in most African countries. Accompanying this trend is domestic investment which is also on the uptick. . Given these developments, the time seems right to revisit the question of the key to unlocking Africa's growth and sustaining it. Does domestic investment hold the key? Does the source of financing for investment matter?

This paper, therefore, aims to contribute to the discussion on the investment financing dimension of the growth dynamics by investigating the role of various sources of capital in financing domestic investment in Africa. While various strands of the literature have investigated the role of individual sources of financing for investment, very few studies have explicitly taken the initiative of systematically examining the relative importance of these sources.

One strand of the literature examines the role of domestic financing for investment. In the spirit of the seminal work by Feldstein and Horioka (1980), empirical studies have established an important role of domestic savings as a driver of domestic investment in Africa (see Payne and Kumazawa (2006)). Within this strand, a cluster of studies have documented the positive role played by financial development, concluding that efficient financial intermediation holds part of the key to boosting domestic investment (see Ndikumana (2000)). The other strand of the literature examines the importance of external capital flows, with an emphasis on foreign aid, sovereign external debt, and to a lesser extent, foreign direct investment (FDI) and migrant remittances. As discussed in the next section, the evidence varies by type of capital flows, the context and methodology.

This paper aims to address the following questions: 1) Is domestic investment in Africa constrained by finance? In other words, does finance positively affect domestic investment in African countries? (2) Does the source of finance matter for the link between domestic investment and finance? This investigation is especially relevant given that foreign private capital flows, notably FDI and remittances have increased substantially over the past two decades, surpassing official development aid and external debt flows in some countries.[3] This paper specifically examines the impact of these various forms of financing on domestic investment in Africa. It uses panel data for 50 African countries over the period 1971-2012 to estimate an investment model where indicators of domestic and external financing are included individually and then simultaneously to test their individual and joint significance, conditional on other fundamental determinants of investment. The domestic sources of finance considered are domestic savings and bank credit to the private sector as an indicator of financial intermediation. External finance consists of official development aid, external public debt, FDI and migrant remittances.

The econometric estimation takes into account heterogeneity across countries and potential bias due to omitted country-specific factors using a fixed-effect model. A dynamic panel data (DPD) estimation method is used to incorporate the dynamic nature of investment – by including a lagged dependent variable – and to account for endogeneity of regressors, notably growth. The

[3] In 2011, remittances exceeded ODA in Algeria, Egypt, Lesotho, Mauritius, Morocco, Nigeria, Senegal, Seychelles, Sudan, and Tunisia (World Bank's World Development Indicators, available online).

empirical results show that in the case of African countries, investment is driven by three key financing sources, namely domestic savings, bank credit to the private sector, and foreign direct investment. The results show no statistically significant effects of aid, external debt or migrant remittances.

The rest of the paper is organized as follows. Following this introduction, the next section provides a review of the relevant literature. Section 3 presents the empirical analysis; it describes the model specification, presents highlights from the data, and discusses the regression results. Section 4 concludes.

2. Literature review

In this section, no attempt is made to provide an exhaustive review of the large literature on investment. Instead the attention is focused on the role of various sources of financing for investment, highlighting specific evidence on the case of African countries as much as possible.

Domestic financing and investment

The economics literature has traditionally attributed an important role to domestic savings in the process of long-run growth and economic development. According to Sir Arthur Lewis, economic development involves transformation of a low-saving economy into one with high saving rates (Lewis, 1954). One of the channels of the effect of saving on growth is through domestic investment. In the context of imperfect capital mobility, domestic savings are the key determinant of domestic investment. Feldstein and Horioka (1980) formally demonstrated this relationship in the case of developed countries. The relationship would be expected to be even tighter in the case of developing countries which face more constraints to accessing foreign capital markets. Indeed, empirical evidence supports this prediction. However, the evidence also shows important cross-country variations, implying that failure to account for such heterogeneity in cross-section regression analysis may lead to incorrect rejection of the saving-investment relationship. This was the case in Payne and Kumazawa (2005) and Coakley, Hasan, and R. (1999). By accounting for heterogeneity using mean group estimator, the relationship between

domestic savings and domestic investment is found to be positive and statistically significant (Coakley, Fuertes, & Spagnolo, 2004; Payne & Kumazawa, 2006).

Studies focusing explicitly on Africa have also documented a positive impact of domestic savings on domestic investment. Oyejide (2002) examines trends in aggregate investment in sub-Saharan African countries from the late 1960s to the mid-1990s and finds that they closely match trends in aggregate domestic savings over the period. This empirical evidence suggests that low domestic savings is a cause of concern for investment and growth. Indeed, African countries have traditionally performed poorly on the saving front. By the mid-1990s, the rate of saving in Africa was half the rate in East Asia – 15 percent of GDP compared to 30%, respectively (Loayza, Schmidt-Hebbel, & Servén, 2000). The situation has not changed, especially in the case of sub-Saharan African developing countries. This group's average domestic savings to GDP ratio was 16.6% in 2013, compared to 46.4% for East Asia and Pacific (developing countries only).[4]

A key condition for the effectiveness of the linkages between domestic savings and domestic investment is the level and efficiency of financial intermediation in the economy. Specifically, financial intermediation plays an important role by shifting the composition of savings towards investment capital (Bencivenga & Smith, 1991). This is due to the special functions played by financial intermediaries, especially resource pooling, maturity transformation, price discovery and risk mitigation, which are essential for investment (Levine, 1997). Thus, efficient financial intermediation maximizes the use of available resources to meet the needs of investors, and it helps to channel resources into the most productive investments. From a cross-country perspective, the evidence shows that, indeed, financial development is strongly correlated with domestic investment (Levine, 1997; Levine, Loayza, & Beck, 2000). It is important to note that the links between financial development and investment, and between financial development and growth do not depend on the structure of the financial system, whether it is stock market-based or bank-based. What matters is the level financial development in terms of depth, efficiency and sophistication of the financial system (Levine & Zervos, 1998; Ndikumana, 2005).

[4] The data reported here are from the World Bank's World Development Indicators (Regional Aggregates), accessible online.

The postulated positive relationship between financial development and domestic investment has also been documented in the case of African countries. For a panel data set covering the majority of African countries, Ndikumana (2000) constructs a composite measure of financial intermediation and tests the effects of financial development on domestic investment. The results conclusively confirm a positive relationship between domestic investment and financial development. In the same vein, Ghura and Goodwin (2000) find that private investment in sub-Saharan African countries is significantly influenced by financial development. Using a balanced panel of 20 sub-Saharan African countries to test the saving-investment nexus, Adeniyi and Egwaikhide (2013) find that in general financial deepening matters little for this nexus. However, when saving is interacted with financial development measured by credit to the private sector, they find that the interaction term exerts a positive and significant influence on investment. This suggests an important role for financial development in mobilizing domestic savings to finance investment. Overall, the evidence supports a positive association between financial development and domestic investment in Africa as in other regions.

External financing and investment

Based on the premise that domestic investment depends on domestic savings, there is a widely held view that capital flows have a positive effect on domestic investment by supplementing domestic savings. Thus, in his investigation of the determinants of the rates of long run growth across countries, Leontief (1965) suggested that transfers of capital from developed countries to developing countries play an important role as a driver of growth. In practical terms, Leontief considered that the key source of foreign capital was foreign aid. This would imply that to the extent that foreign capital inflows are used to finance capital investment, countries that receive more foreign aid would achieve higher levels of investment. However, the effect of foreign aid on domestic investment may be limited if a substantial fraction of foreign aid is allocated to financing consumption. Moreover, it has also been argued that foreign aid may reduce domestic savings and increase consumption (Griffin, 1970), in which case aid inflows would have little or no effect on domestic investment. This argument, however, has been contested on both conceptual and empirical grounds (Eshag, 1971; Kennedy & Thirlwall, 1971; Stewart, 1971).[5]

[5] See Griffin (1971) for a reply to the comments.

The postulated positive relationship between foreign aid and domestic investment has been an important motivation for promoting increased aid inflows to developing countries as a means of spurring domestic investment, which in turn is expected to stimulate growth. Dollar and Easterly (1999) challenged the aid-investment-growth model by questioning both links in the relationship in the case of African countries. Specifically, they argue that investment does not have a "tight link to growth in the short run, and not even much of a link in the long run in Africa" (Dollar & Easterly, 1999, p. 547). As for the aid-investment link, the authors argue that it is conditional on good policies: "foreign aid leads to private investment in an environment of good policies, but not in an environment of poor policies" (Dollar & Easterly, 1999, p. 572). If the Dollar-Easterly claim is correct, then given the remarkable improvement in the policy environment (at least as defined by the authors) in Africa over the past two decades, we should observe a positive and tighter relationship between foreign aid and domestic investment in Africa. The empirical analysis in this paper aims to explore this issue.

Over the past two decades, attention has increasingly turned to the role of private external capital inflows in stimulating domestic investment in developing countries. In the case of Africa, the attention has mostly been focused on foreign direct investment. The volume of portfolio flows remains insignificant given the low level of stock market development in the continent, with the exception of South Africa. More recently, migrant remittances have emerged as an important form of private capital flows, surpassing official development aid in some countries (see World Bank and African Development Bank (2011)).[6] The empirical question is whether these private capital flows have an impact on domestic investment. Specifically, do they help bridge the saving-investment gaps in African countries?

Cross-sectional studies tend to find that FDI has a positive effect on domestic investment. Using a sample of 38 sub-Saharan African countries, Ndikumana and Verick (2008) find a strong relationship between FDI and domestic investment that runs both ways; that is, FDI crowds-in private investment while private investment also tends to drive foreign investment. In a

[6] Ratha (2005) finds that for developing countries in general, remittances are the second largest source of external funding behind FDI, and that relative to the other sources of external funding, remittance flows have been less volatile.

comparative study including Africa, Asia and Latin America, Agosin and Machado (2005) find that FDI increases domestic investment one-to-one in Africa.[7]

With regard to migrant remittances, there is little evidence on their relationship with domestic investment generally, and even less in the case of African countries. Remittances are typically allocated to financing consumption of goods and social services, especially education and health. They play an important role in helping recipient households to smooth consumption in the presence of economic downturns and natural shocks. The few studies that have investigated the impact of remittances in the case of African countries find that they positively affect both domestic savings and domestic investment (Baldé, 2011; Nyamongo, Misatib, Kipyegonb, & Ndirangu, 2012). However, further investigation is needed to assess the generalizability and robustness of these findings.

While most studies have exclusively focused on the relationship between investment and one form of financing, namely savings, financial intermediation, aid, FDI, or remittances, this paper aims to investigate the relative effects of the alternative sources of finance individually and jointly on domestic investment. The next section presents the empirical model to accomplish this goal and discusses the results of the econometric analysis.

3. Empirical analysis

Highlights from the data

This paper uses an unbalanced data set for 50 African countries over the period from 1971 to 2012. The data are obtained from the World Bank's *World Development Indicators* and UNCTAD's, and the African Development Bank's online databases.[8] The list of variables used in the analysis, their definitions and sources are given in Table A1 in the appendix. Table A2 in the appendix presents summary statistics for the regression variables.

[7] The effect is also positive for Asia, but it is negative for Latin America. The authors interpret the result for Latin America as an effect of the move towards more liberalized multinational enterprises.
[8] The African Development Bank database was used to complete missing data for some countries for the current account balance and the government fiscal balance.

The examination of the trends of domestic investment and indicators of financing sources reveals some noteworthy patterns that are relevant for the research question at hand. First, the data show that average domestic investment in Africa has trended upward since the turn of the century, following protracted stagnation during the 1980s and a short-lived recovery of the early 1990s. As can be seen on Figure 1, the upswing in domestic investment coincides with the growth acceleration observed throughout the continent as documented in the recent literature (see AfDB, OECD, UNDP, and UNECA (2014)).[9] This evidence points to the empirical question of whether the growth resurgence was stimulated by rising domestic investment or whether it stimulated domestic investment or both. This paper focuses on the relation running from growth to domestic investment, while recognizing the reciprocal relation by controlling for endogeneity of growth in the econometric analysis.

[Insert Figure 1 here]

The second observation from the data is an upward trend in key sources of investment financing, especially starting from the turn of the century. Starting with domestic sources of financing, domestic savings have closely tracked domestic investment, exhibiting an upswing from 1998 which has been sustained except for a dip during the great recession (Figure 1). Bank credit to the private sector increased steadily since the 1990s through 2009, but it has not recovered from the shock from the global crisis. The average bank credit to GDP ratio is still trending downward since 2009.

External sources of financing show two distinctive trends: while public sources, namely official development aid and external debt, have reversed their upward trend since the 1990s, private sources of financing – foreign direct investment and remittances – have trended upward over the past two decades (Figure 2). The average ODA to GDP ratio for the sample declined from a peak of 7.7% in 1991 to a record low of 2.4% in 2011. Similarly, the average external debt to GDP ratio systematically declined from a peak of 90.7% in 1993 to 19.9% in 2011, as a result of the debt relief programs initiated since the second half of the 1990s. In contrast, the FDI to GDP ratio more than doubled between 2000 and 2009 before reversing its trend during and after the

[9] The recent growth resurgence has ignited a debate on an "African growth miracle". See, among others, Rodrik (2014); Young (2012); Harttgen, Klasen, and Vollmer (2013); and McMillan and Harttgen (2014).

global crisis. Migrant remittances have proved to be more resilient to the crisis; they briefly declined during the crisis but quickly recovered their upward trend thereafter.

Econometric analysis is used to investigate the implications of these trends for domestic investment. Specifically the analysis aims to explore the link between various financing sources and domestic investment in African countries.

[Insert Figure 2 here]

Model specification

The analysis in this paper is premised on the view that domestic investment is finance constrained. Investment may be financed by a combination of domestic and external finance. The empirical analysis aims to explore the following questions set out in the introduction of the paper: (1) Is domestic investment in Africa constrained by finance? In other words, does finance positively affect domestic investment in African countries? (2) Does the source of finance matter for the link between domestic investment and finance?

These questions are investigated by estimating an empirical investment model incorporating, as regressors, measures of the various sources of investment financing while controlling for non-financial determinants of domestic investment. The analysis tests whether the various sources of financing have a statistically significant effect on domestic investment, and whether the results vary by type of financing source. In particular, the analysis enables us to compare the role of domestic sources – saving and bank credit, to foreign financing – ODA, FDI, and migrant remittances. Moreover, the paper explores possible non-linearities in the relationship between domestic investment and financing. In particular, a quadratic relation between domestic investment and bank credit to the private sector is specified to explore threshold effects in the investment-financial intermediation nexus. This may provide insights on whether the relationship varies as the degree of financial development increases. On the one hand, it may be argued that finance alleviates constraints to investment, and therefore investment would increase in tandem with financial intermediation. On the other hand, it could be argued that the effects of financial intermediation on investment may exhibit diminishing returns. This could be the case if at higher levels of financial development, more resources are diverted to other uses such as speculative

activities, which would not only reduce the rate of capital accumulation but also increase macroeconomic instability, further depressing domestic investment. A quadratic specification of the investment function enables us to empirically explore these possible relationships.

The empirical investment model is specified as follows:

$$I_{it} = \alpha + \beta F_{it} + \boldsymbol{X}_{it}\Gamma + \mu_i + \varepsilon_{it} \quad (1)$$

For a country *i* in year *t*, *I* is domestic investment, which is measured by gross capital formation as percentages of GDP; *F* represents a measure of investment financing, namely gross domestic savings, bank credit to the private sector, foreign direct investment, official development assistance, external debt, and migrant remittances, all of which are scaled by GDP; **X** is a vector of non-financial determinants of investment; μ_i represents country-specific omitted fixed factors; and ε_{it} is a random error term.

The econometric analysis is implemented in two stages. In the first stage, we consider an investment model that includes a minimum number of fundamental determinants of domestic investment or control variables and test the effects of individual sources of financing by adding one indicator at a time. Two fundamental factors that have proved to be robust determinants of domestic investment at the aggregate level in cross-country settings, namely growth and trade (Ndikumana, 2000, 2014), are considered. Theoretically, the growth-investment relation derives from the accelerator model proposed by Jorgenson, which has been the bedrock of empirical analysis of the determinants of aggregate investment (Jorgenson, 1971). The argument is that an increase in output measured by GDP growth embodies an increase in expected demand for goods and services as well as expected higher returns to domestic investment, both of which encourage investment. We would therefore expect a positive relation between growth and investment. The trade-investment link is motivated by the fact that trade expansion is associated with increased access to both output markets (releasing demand-side constraints) and input markets (releasing supply-side constraints). This implies a positive impact of trade on investment.

In the second stage, we test for the robustness of the first-stage results by estimating an expanded investment model that incorporates other determinants of investment. The first category of additional determinants consists of indicators of the macroeconomic environment in African

countries. The indicators used in this category are the rate of inflation, the fiscal balance, and the current account balance. Inflation is proxied by the purchasing power parity conversion factor, which measures the purchasing power of the local currency by accounting for relative prices and the exchange rate. This variable therefore embodies both the impact of relative prices on investment and the impact of the exchange rate on investment. Over the past two decades, African countries have recorded substantial progress in controlling inflation, which has been maintained at single digits or low double digits in most countries. This has been a welcome departure from the inflationary era of the 1980s and 1990s, which were also marked by high exchange rate instability. Given the high dependence on imported inputs, strengthening of the purchasing power would stimulate investment through higher capacity to import the factors of production. On the flip side, however, a stronger PPP factor means more expensive exports, which would discourage investment by export-oriented producers. The net effect can only be determined empirically.

The government budget balance and the current account balance are incorporated as indicators of potential financing constraints from the domestic side and the external side, respectively. A high current account balance reflects balance of payment constraints to investment, which is important especially given that African countries depend substantially on imported inputs. We would expect a negative effect of the current account deficit on investment. As for the fiscal balance, on the one hand, a high fiscal deficit would crowd-out private investment if it is accompanied by high interest rates. On the other hand, a high fiscal deficit that is driven by increased financing of public investment may be associated with higher total investment. The analysis will help assess whether the data support the infrastructure financing effects or the crowding-out effects in the case of African countries.

The extended model incorporates a measure of revenue from natural resources as an additional determinant of investment. Theoretically we would expect high natural resource endowment to alleviate financing constraints, enabling resource-rich countries to achieve higher levels of domestic investment. Thus, resource booms would be associated with rising domestic investment. The ratio of natural resource rents to GDP (in percentage) is used as a proxy for natural resource endowment. We would expect a positive effect on the rents on domestic investment.

Other potential determinants of investment were explored, but they were eventually dropped as they turned out to be statistically insignificant. In particular, we considered measures of the investment environment proxied by governance and legal environment indicators from the ICRG: corruption, rule of law, bureaucratic effectiveness, socio-economic conditions, and a combined index. They all turned out to be insignificant.

Estimation procedure

The choice of the estimation methods adopted in this paper was driven by the nature of the phenomenon to be investigated – investment, the type of data – panel data including heterogeneous units, and the variables included in the empirical model. First, fixed-effects estimation is used to account for the heterogeneity across countries and to minimize potential bias due to omitted country-specific factors. Hausman specification test scores are produced to verify whether the fixed-effects model which generates consistent estimates is indeed more appropriate than the random-effects model which generates efficient but inconsistent estimates. Second, given that investment is by essence a dynamic phenomenon, it should be specified as a dynamic model. This is accomplished by including a lag of the dependent variable as a regressor. In such a formulation, fixed-effects results obtained by estimating a first-differenced equation are not consistent given that the first-differences of the lagged dependent variable and those of the error term are not independent.

Moreover, some of the regressors are potentially endogenous. Specifically, GDP growth is considered as endogenous as discussed earlier. The Arellano-Bover/Bulndell-Bond dynamic panel data (DPD) estimation methodology is used to account for these two features of the model and the data (Arelano & Bond, 1991; Arellano & Bover, 1995; Blundell & Bond, 1998). Diagnostic test scores are produced to verify the validity of the overidentifying restrictions (Sargan test, a Chi-squared statistic) as well as the presence of a second order serial correlation in first-difference errors (coefficient on the second autocorrelation term) in a two-step procedure.

Discussion of regression results

Table 1 presents results for the base model obtained with fixed-effects estimation while Table 2 reports results from DPD estimation. In columns 1-6, each individual financing source is included separately to the base regression that incorporates only growth and trade as control

variables. In column 7, only variables that have a significant coefficient are retained in a 'parsimonious' specification.

The fixed-effects regression results show a positive and statistically significant effect of domestic sources of financing on domestic investment. Specifically, domestic savings appear to be an important driver of domestic investment. Similarly, bank credit to the private sector has a positive and statistically significant effect on domestic investment. The effect is non-linear, suggesting that beyond a certain threshold of the credit to GDP ratio, the relationship between credit and investment turns negative. However, in this particular sample, no country reaches the threshold implied by the regression results (a ratio of 2.8) consistently, implying that there is plenty of room for credit to increase in the range where the relationship between domestic investment and credit to the private sector is positive. The effect of credit on investment is quantitatively much larger than that of domestic savings. The results suggest that improvements in access to investment capital from the banking sector are a more potent tool to stimulate domestic investment than domestic savings. In other words, while both bank credit and domestic savings constitute potential sources of investment financing, domestic savings that are intermediated through the banking sector ultimately alleviate the financing constraints more effectively. The two results taken together are consistent with prior studies in the literature that have documented a powerful role by financial intermediation for domestic investment in Africa (Ndikumana, 2000, 2005, 2014).

With regard to external sources of financing, we distinguish between public and private capital inflows. On the public side, the results show that neither ODA nor external debt has a statistically significant effect on domestic investment. We explore whether the observed structural break marked by a steady decline in ODA (starting in 1991) and external debt (starting in 1993) had an impact on the results for these two indicators by creating a period dummy (the dummy equals one for the period where ODA or debt declined steadily and zero otherwise). The dummy is interacted with debt and ODA, alternatively. The results for ODA are unchanged: the coefficients on both ODA and the interaction term are statistically insignificant. The results for external debt are also unchanged in the fixed-effect regressions. In the DPD results, the coefficient on debt becomes negative and statistically significant, but the interaction term is

statistically insignificant. The results suggest that while debt may have exerted some negative impact on domestic investment in African countries, the effect is not robust.[10].

The absence of a significant impact of aid on domestic investment is not surprising given that a substantial share of aid to Africa is allocated to social sectors, general recurrent expenditures and humanitarian aid (in the case of conflict and post-conflict countries). In other words, the result confirms that aid has not been targeted to domestic investment to a significant extent, lending support to the critics and skeptics of the role of foreign aid in financing promoting domestic investment (Dollar & Easterly, 1999; Griffin, 1970).

With regard to private external financing, only FDI turns out to have a statistically significant effect on domestic investment. The results suggest that a substantial share of FDI is destined to investment in new activities or expansion of existing firms. Note, however, that the effect of FDI is comparatively smaller than that of domestic savings and bank credit.

Migrant remittances appear to have no statistically significant impact on domestic investment. This result is consistent with the fact that remittances are primarily used to finance household consumption and human capital accumulation though financing health and education. While there may be pent up demand for investment by the diaspora, such a demand does not materialize due to lack of appropriate investment vehicles, a rigid regulatory environment, and high transactions costs.

Table 2 presents DPD regression results which incorporate the dynamic feature of investment by including the first lag of investment and also account for possible endogeneity of regressors, specifically GDP growth. The DPD results are largely consistent with the fixed-effects results. The sources of financing that matter for investment are domestic savings, bank credit to the private sector, and FDI. One difference is that the quadratic formulation of the investment-credit relationship no longer holds; the coefficients on the level and square of the ratio of credit to GDP are both statistically insignificant. Therefore, in the DPD regressions, the linear specification is

[10] The regression results with the time break dummy are not presented here; they are available from the authors upon request.

retained, where bank credit turns out to have a positive and statistically significant effect on investment. The effect of credit is relatively larger than that of domestic savings and ODA as in the case of the fixed-effects model. ODA, external debt and remittances are not statistically significant in DPD model. Growth also drops out of the parsimonious regression (column 7 in Table 2) as it is no longer statistically significant when all regressors are included simultaneously.

To further explore the robustness of the results, we present estimates for a model including variables that account for the macroeconomic environment (PPP factor, current account balance, and fiscal balance) and natural resource endowment (measured by natural resource rents as a percentage of GDP). Table 3 presents the fixed-effect estimation results, while Table 4 reports the DPD estimation results. The results are broadly consistent with those from the base model regressions. Three sources of financing systematically have a positive and significant effect on domestic investment, namely domestic savings, bank credit to the private sector, and FDI. Bank credit to the private sector has a stronger effect compared to the other two sources. We note that in the extended model, ODA has a positive and statistically significant effect on domestic investment in the fixed-effects estimates (Table 3). However, the result does not hold in the DPD model incorporating the dynamic nature of investment and accounting for endogeneity of GDP growth (Table 4). We can conclude therefore that ODA has no substantial impact on investment. Moreover, the extended model accommodates the quadratic formulation of the credit-investment relationship. Both the level and squared terms of the ratio of credit to GDP are statistically significant. The coefficient on the squared term is negative, suggesting a concave shape of the investment-credit relationship. As indicated earlier, however, in this sample, for all the countries, an increase in bank credit to the private sector will lead to higher domestic investment as the threshold for the negatively sloped part of the relationship is too high for any country to be above the threshold for any meaningful period.

A word on control variables is in order before wrapping up the discussion on the regression results. As expected, investment exhibits strong path dependence as shown by the large positive and statistically significant coefficient on lagged investment. Domestic investment appears to ride on the momentum of past high performance. Also as expected, trade is a strong driver of domestic investment. The coefficient on the trade-GDP ratio is positive, large and statistically

significant in every specification. It is indeed the most robust determinant of domestic investment.

The macroeconomic environment also appears to have a significant influence on investment in African countries. Specifically, the current account deficit has a negative impact on domestic investment in both fixed-effects and DPD models. The results imply that the deepening of current account deficits lead to lower investment. This may illustrate a foreign exchange constraint on investment that depends on imported input. In contrast, the fiscal deficit appears to have no statistically significant effect on domestic investment. There is therefore no evidence of either crowding out of domestic investment by budget deficits (which would result in a negative effect) or deficits being driven by public investment (which would yield a positive effect).

Endowment in natural resources does not seem to have a robust effect on domestic investment. The ratio of natural resource rents to GDP has a negative and statistically significant coefficient in only two out of the 12 regressions where the variable is included. The absence of a significant link between natural resources and investment may suggest that resource-rich countries have not leveraged their resource endowment to finance capital accumulation, which is consistent with evidence in the literature (Elhiraika & Ndikumana, 2009). This may be one of the reasons why they have experienced high volatility of growth and have been unable to achieve structural transformation.

4. Conclusion

The results from this paper lead to two main conclusions. First, domestic investment in African countries is driven primarily by domestic sources of financing, namely savings and credit to the private sector. The latter has the largest and most robust effect among all sources of investment capital. Second, foreign direct investment is the only form of foreign capital that has a significant effect on domestic investment. Its positive effect is complementary to that of domestic savings and credit to the private sector, but it is quantitatively smaller.

Official development aid has no effect on domestic investment. The question then is: where does the aid go? The fact that aid does not have a positive effect on domestic investment does not necessarily imply that aid is ineffective. Instead, to the extent that aid finances legitimate

consumption spending, social services, capacity building, and other socially desirable, albeit non-investment uses, it will have a positive effect on economic development. The results in this paper, therefore, should not be interpreted as evidence of ineffectiveness of foreign aid to African countries.

As for external debt, the fact that the econometric results do not confirm the expected negative overhang effect on domestic investment is consistent with the reduction in the debt burden in the post-HIPC period. In that sense, the debt relief programs have produced positive results. However, the results in this paper do not rule out the possibility of adverse effects in the event of new debt build up in the future. It is, therefore, important for African countries to minimize the risk of a new cycle of indebtedness through prudential borrowing and efficient debt management.

The absence of a significant impact of migrant remittances on domestic investment is consistent with the fact that remittances primarily target household consumption and social services. However, given an appropriate investment environment and specific mechanisms to reduce transfer fees and minimize transactions costs, remittances may be a potentially important source of investment capital especially for small and medium enterprises. They should therefore feature prominently in the set of policies tool for increasing domestic investment.

Overall, the results in this paper have a clear policy message: as African countries design strategies to accelerate domestic investment in their quest to reach and sustain higher growth rates, their primary focus should be to look inward; that is, design strategies to enhance access to low cost credit for the private sector and incentivize domestic resource mobilization.

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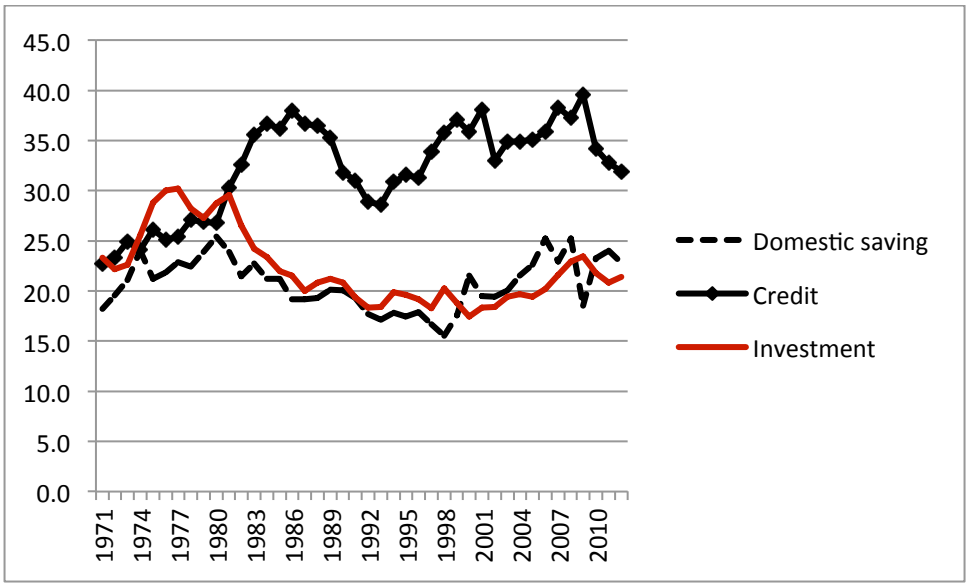
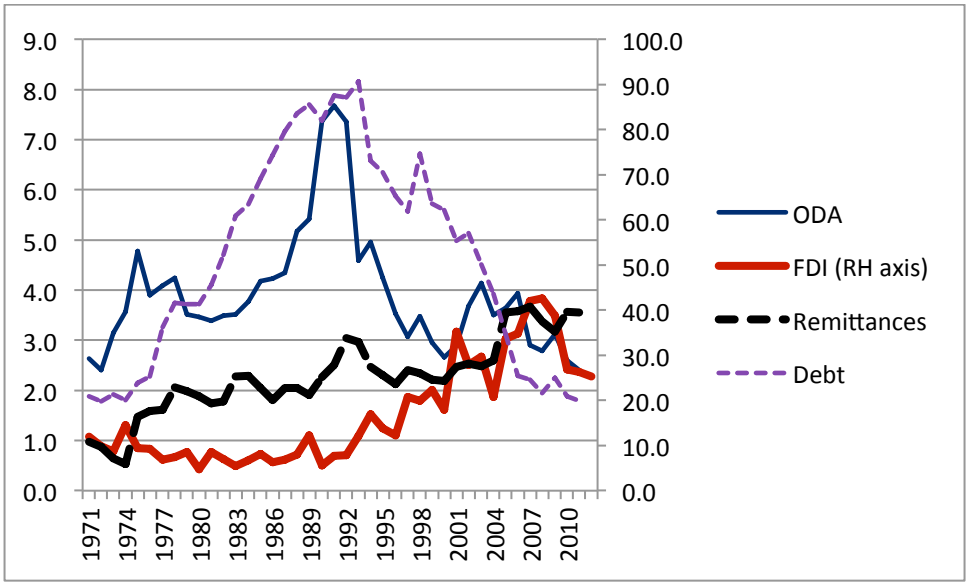
Figure 1: Investment and domestic sources of financing: sample averages (% of GDP) *



Source: Authors' computation using data from World Development Indicators.

* Note: GDP-weighted averages.

Figure 2: External sources of investment financing: Sample averages (% of GDP) *



Source: Authors' computation using data from World Development Indicators.

* Note: GDP-weighted averages.

Table 1: Domestic investment and sources of financing: Base model, fixed-effects estimates

VARIABLES	(1) Savings	(2) Credit	(3) ODA	(4) FDI	(5) Debt	(6) Remittances	(7) Parsimonious
GDP growth	0.006**	0.010***	0.010***	0.009***	0.012***	0.009***	0.005**
	(0.036)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.026)
Trade	0.536***	0.441***	0.510***	0.422***	0.513***	0.573***	0.365***
	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)
Domestic savings	0.048**						0.049**
	(0.014)						(0.034)
Bank credit		0.410***					0.537***
		(0.003)					(0.000)
Bank credit squared		-0.074***					-0.085***
		(0.006)					(0.000)
ODA			0.011				
			(0.664)				
FDI				0.031**			0.034**
				(0.017)			(0.023)
External debt					-0.035		
					(0.376)		
Remittances						-0.033	
						(0.227)	
Constant	0.585	0.563	0.751*	1.155**	0.896*	0.563	0.548
	(0.172)	(0.202)	(0.089)	(0.020)	(0.075)	(0.182)	(0.229)
Observations	1,487	1,782	1,813	1,583	1,746	1,315	1,196
Number of countries	48	50	50	50	48	50	48
Within R-squared	0.194	0.186	0.161	0.164	0.159	0.201	0.295
Between R-squared	0.295	0.271	0.320	0.292	0.269	0.257	0.235
Overall R-squared	0.215	0.228	0.230	0.216	0.216	0.180	0.224
Hausman test: Chi-squared	14.69	13.45	7.02	5.40	7.79	21.19	26.87
(prob)[(a)]	(0.00)	(0.01)	(0.07)	(0.14)	(0.05)	(0.00)	(0.00)

Robust p-values in parentheses; *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is domestic investment (gross capital formation) as a percentage of GDP. All regression variables are in logarithm, except for GDP growth rate.

[(a)] Note: Hausman test: H0 = the differences between fixed-effects (consistent) coefficients and random-effects (efficient but inconsistent) coefficients are not systematic.

Table 2: Domestic investment and sources of financing: Base model, DPD estimates

VARIABLES	(1) Savings	(2) Credit	(3) ODA	(4) FDI	(5) Debt	(6) Remittances	(7) Parsimonious
Lagged investment	0.556***	0.528***	0.660***	0.666***	0.632***	0.682***	0.491***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
GDP growth	0.000	0.004***	0.003***	0.002***	0.008***	0.009***	
	(0.159)	(0.001)	(0.001)	(0.010)	(0.000)	(0.004)	
Trade	0.367***	-0.007	0.328***	0.060	0.175*	0.100	0.312***
	(0.000)	(0.960)	(0.002)	(0.510)	(0.086)	(0.217)	(0.000)
Domestic savings	0.042***						0.031***
	(0.000)						(0.000)
Bank credit		0.139***					
		(0.010)					
ODA			0.011				
			(0.633)				
FDI				0.019***			0.022***
				(0.000)			(0.000)
External debt					-0.044		
					(0.248)		
Remittances						-0.002	
						(0.915)	
Constant	-0.292	1.053	-0.382	0.739*	0.509	0.509*	0.141**
	(0.174)	(0.108)	(0.408)	(0.083)	(0.355)	(0.090)	(0.043)
Observations	1,455	1,750	1,779	1,568	1,713	1,312	1,240
Number of countries	48	50	50	50	48	50	48
Sargan test: Chi-square[(a)]	39.967	42.573	41.885	42.255	40.89	42.86	47.13
2nd-order serial correlation coefficient[(b)]	0.63	-0.045	0.536	0.139	0.203	0.299	-0.086
	(0.52)	(0.96)	(0.59)	(0.89)	(0.84)	(0.76)	(0.93)

P-values in parentheses; *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is domestic investment (gross capital formation) as a percentage of GDP. All regression variables are in logarithm, except for GDP growth rate.

[(a)] Note: Sargan test of overidentifying restrictions; H0: overidentifying restrictions are valid. The null hypothesis cannot be rejected in all regressions.

[(b)] Note: Arellano-Bond test for zero autocorrelation in first-differenced errors; H0: no autocorrelation.

Table 3: Domestic investment and sources of financing: Extended model, fixed-effects estimates

VARIABLES	(1) Savings	(2) Credit	(3) ODA	(4) FDI	(5) Debt	(6) Remittances	(7) Parsimonious
GDP growth	0.002	0.003	0.002	0.004	0.009**	0.007*	0.003**
	(0.197)	(0.125)	(0.313)	(0.150)	(0.033)	(0.081)	(0.036)
Trade	0.478***	0.391***	0.502***	0.419***	0.473***	0.420***	0.259**
	(0.002)	(0.001)	(0.000)	(0.000)	(0.000)	(0.007)	(0.011)
Fiscal balance	-0.001	-0.001	-0.000	-0.001	-0.001	-0.001	
	(0.301)	(0.573)	(0.891)	(0.614)	(0.644)	(0.627)	
Current account balance	-0.012***	-0.010***	-0.010***	-0.010***	-0.013***	-0.009***	-0.011***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)	(0.000)
PPP factor	0.500***	0.195	0.462**	0.321*	-0.025	0.168	0.317***
	(0.001)	(0.321)	(0.035)	(0.097)	(0.928)	(0.589)	(0.004)
Resource rents	-0.025	-0.024	-0.018	-0.022	-0.010	-0.016	
	(0.381)	(0.428)	(0.561)	(0.470)	(0.742)	(0.621)	
Domestic savings	0.085***						0.080***
	(0.000)						(0.000)
Bank credit		0.311***					0.277***
		(0.001)					(0.002)
Bank credit square		-0.046**					-0.050**
		(0.036)					(0.017)
ODA			0.080*				
			(0.074)				
FDI				0.032*			0.036***
				(0.088)			(0.000)
External debt					-0.068		
					(0.125)		
Remittances						0.00002	
						(0.999)	
Constant	0.533	0.748	0.460	1.004**	1.155**	1.091*	1.148***
	(0.379)	(0.114)	(0.368)	(0.026)	(0.024)	(0.093)	(0.006)
Observations	684	826	810	811	778	663	626
Number of countries	46	49	49	49	47	47	46
Within R-squared	0.393	0.351	0.321	0.310	0.298	0.185	0.448

Between R-squared	0.212	0.254	0.141	0.245			
Overall R-squared	0.258	0.283	0.201	0.277			
Hausman test: Chi-squared	11.00	4.70	17.16	7.4			
(pr)	(0.14)	(0.79)	(0.02)	(0.38)	()	()	()

Robust p-values in parentheses; *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is domestic investment (gross capital formation) as a percentage of GDP. All regression variables are in logarithm, except for the current account balance, the fiscal balance and GDP growth rate.

[(a)] Note: Hausman test: H0 = the differences between fixed-effects (consistent) coefficients and random-effects (efficient but inconsistent) coefficients are not systematic.

Table 4: Domestic investment and sources of financing: Extended model, DPD estimates

VARIABLES	(1) Savings	(2) credit	(3) ODA	(4) FDI	(5) Debt	(6) Remittances	(7) Parsimonious
Lagged investment	0.398***	0.442***	0.532***	0.536***	0.429***	0.549***	0.416***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
GDP growth	-0.001**	0.001	-0.0004	-0.0001	0.003**	0.006***	
	(0.035)	(0.251)	(0.170)	(0.933)	(0.032)	(0.000)	
Trade	0.510***	0.297***	0.247**	0.280***	0.375***	0.395***	0.170***
	(0.000)	(0.000)	(0.013)	(0.000)	(0.000)	(0.000)	(0.001)
Fiscal balance	-0.0004	0.002*	0.001	0.001	0.001	0.002	
	(0.422)	(0.091)	(0.304)	(0.354)	(0.420)	(0.247)	
Current account balance	-0.008***	-0.007***	-0.006***	-0.006***	-0.008***	-0.005***	-0.008***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
PPP factor	0.257***	0.003	0.255*	0.211	-0.076	-0.033	
	(0.003)	(0.972)	(0.066)	(0.124)	(0.655)	(0.813)	
Resource rents	-0.071**	-0.017	-0.055	-0.033	0.033	-0.029	
	(0.019)	(0.623)	(0.162)	(0.338)	(0.367)	(0.249)	
Domestic savings	0.056***						0.047***
	(0.000)						(0.000)
Bank credit		0.321*					0.138***
		(0.069)					(0.000)
Bank credit squared		-0.059					-0.014***
		(0.152)					(0.001)
ODA			0.039				
			(0.161)				
FDI				0.018***			0.031***
				(0.000)			(0.000)
External debt					-0.012		
					(0.775)		
Remittances						-0.005	
						(0.693)	
Constant	-0.462**	0.016	0.242	0.139	0.074	-0.290	0.619**
	(0.025)	(0.949)	(0.611)	(0.360)	(0.884)	(0.172)	(0.011)
Observations	684	826	810	811	778	663	635

Number of countries	46	49	49	49	47	47	47
Sargan test: Chi-square[(a)]	37.549	38.964	40.773	43.901	37.102	39.69	43.979
2nd-order serial correlation	-0.147	0.469	0.484	0.125	-0.142	1.022	0.502
coefficient[(b)]	(0.88)	(0.63)	(0.628)	(0.209)	(0.88)	(0.306)	(0.615)

P-values in parentheses; *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is domestic investment (gross capital formation) as a percentage of GDP. All regression variables are in logarithm, except for GDP growth rate.

[(a)] Note: Sargan test of overidentifying restrictions; H0: overidentifying restrictions are valid. The null hypothesis cannot be rejected in all regressions.

[(b)] Note: Arellano-Bond test for zero autocorrelation in first-differenced errors; H0: no autocorrelation.

APPENDIX

Table A1: List of variables and data sources

Variable symbol	Variable definition	Sources
gcf_gdp	Gross capital formation (% of GDP)	UNCTAD
gds_gdp	Gross domestic savings (% of GDP)	World Development Indicators
totdebtdisb_gdp	Total debt outstanding and disbursed (% of GDP)	World Development Indicators
oda_gdp	Net ODA received (% of GDP)	World Development Indicators
fdi_gdp	Foreign direct investment, net inflows (% of GDP)	World Development Indicators
privcredit_gdp	Domestic credit to private sector by banks (% of GDP)	World Development Indicators
resourcerent_gdp	Total natural resources rents (% of GDP)	World Development Indicators
trade_gdp	Trade (imports + exports as % of GDP)	World Development Indicators
ppp	PPP conversion factor (GDP) to market exchange rate ratio	World Development Indicators
growth	GDP growth (annual %)	UNCTAD
ca_gdp	Current account balance (% of GDP)	World Development Indicators; African Development Bank Database
fiscbalance_gdp	Central government's fiscal balance (% of GDP)	World Development Indicators; African Development Bank Database
remit_gdp	Workers' remittances and compensation of employees, received (% of GDP)	World Development Indicators

Table A2: Summary statistics for regression variables

Variable (all in % of GDP except for GDP growth and the PPP conversion factor)	Observations	Mean	Std. Dev.	Minimum	Maximum
Domestic investment	2100	21.3	11.1	1.5	113.3
Domestic saving	1817	11.2	18.9	-103.4	87.7
Bank credit	1830	18.0	15.2	0.2	100.8
ODA	1871	11.2	12.1	-0.3	147.1
FDI	1805	3.3	8.8	-82.9	161.8
Debt	1793	80.2	114.7	0	1829.5
Remittances	1325	4.3	11.3	0.0	106.5
GDP growth	1922	4.0	7.8	-51.0	150.0
Trade	1916	72.2	44.5	6.3	531.7
Fiscal balance	890	-2.2	7.7	-37.8	121.1
Current account	895	-6.2	12.2	-124.6	38.7
PPP conversion factor	1558	0.5	0.2	0.2	2.1
Resource rents	1957	12.3	14.7	0.0	100.4