Working Paper

INTERNATIONAL MONETARY FUND

WP/11/233

IMF Working Paper

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African Department

Determinants of Non-oil Growth in the CFA-Zone Oil Producing Countries: How do they Differ?

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October 2011

Abstract

Non-oil growth in the CFA oil exporting countries has been lackluster despite their great natural resource wealth. In this paper we study the key determinants of non-oil growth and explore to what extent these countries differ from countries with comparable levels of development that do not depend on nonrenewable resources. Using a panel of 38 countries comprising low-income countries (LICs) and CFA zone oil exporters, we find that while real exchange rate appreciation negatively impacted growth in all countries over the period 1985–2008, what distinguishes the oil producers of the CFA zone is the failure of public and private investment to spur non-oil growth.

JEL Classification Numbers: D90, E22, F31, F43, H54

Keywords: economic growth, oil exports, public investment, real exchange rate

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[1] Ms. Tabova is an Economist in the Division of International Finance at the Board of Governors of the Federal Reserve System. This paper was initiated when Ms. Tabova was a summer intern in the IMF's African Department. The views in this Working Paper should not be interpreted as reflecting the views of the Board of Governors of the Federal Reserve System or of any other person associated with the Federal Reserve System. Both authors would like to thank Sharmini Coorey, Bernardin Akitoby, Andrew Berg, Cathy Pattillo and participants in various seminars for their helpful comments and suggestions. Any errors and omissions, however, should be attributed only to the authors. This paper will also comprise a chapter of a forthcoming book on the CEMAC region.

Contents Page

I. INTRODUCTION

Non-oil growth in the CFA zone oil exporting countries has been lackluster despite their great natural resource wealth. This is perhaps unsurprising given that only a few resource-rich countries have succeeded in diversifying their economies (Coxhead, 2007; Gelb and Grasmann, 2010). This often-cited "resource curse" is frequently attributed to three main factors: Dutch disease stemming from real exchange rate appreciation; the high volatility of oil- and mineral-related revenues; and institutional weaknesses, particularly in the areas of governance and transparency.

In this paper we study the key determinants of non-oil growth in the oil producing countries of the CFA zone and explore to what extent these countries differ from countries with comparable levels of development that do not depend on nonrenewable resources. To do this, we extend existing growth models to capture key features of CFA zone oil exporters, namely large development needs, institutional weakness and market imperfections. By incorporating government spending and the efficiency of public goods[2] we derive a tractable general equilibrium model of a small open economy with an oil exporting sector and two non-oil productive sectors in which public investment financed by oil revenue is growth enhancing while institutional weakness and market imperfections lower growth.

Estimation results using a panel of 38 low-income countries (LICs) and CFA zone oil exporters are broadly in line with the theoretical predictions.[3] While real exchange rate appreciation is found to have negatively impacted growth in all countries over the period 1985–2008, what distinguishes the oil producers of the CFA zone is the failure of public and private investment to boost non-oil growth.

II. CFA ZONE OIL EXPORTERS: WEALTH AND DEVELOPMENT NEEDS

Despite their natural resources wealth, the oil exporting countries of the CFA zone have large development needs. This disparity has widened over the past decade, with provision of social services and basic infrastructure lagging far behind burgeoning oil wealth. Poverty is endemic and social indicators are far below those of countries at the same level of income, at times exacerbated by border and internal conflicts, which may also partly explain the widening infrastructure gap relative to a group of select LICs.

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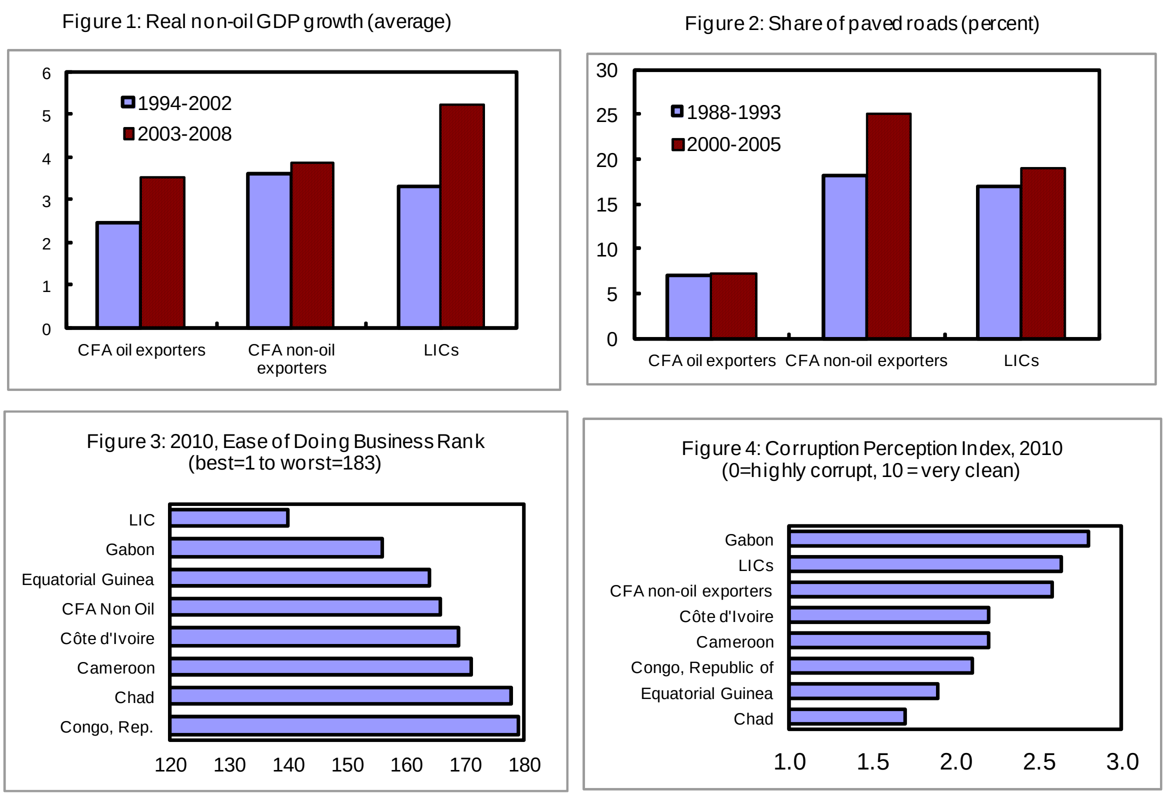
[2] We follow Barro (1990) and Barro and Sala-i-Martin (2004).

[3] The group of low-income countries includes: Benin, Burkina Faso, Central African Republic, Guinea-Bissau, Mali, Niger, Senegal, Togo, Burundi, Comoros, Ethiopia, Gambia, Ghana, Guinea, Kenya, Madagascar, Malawi, Mauritania, Mozambique, Rwanda, Sierra Leone, Tanzania, Uganda, Zambia, Bangladesh, Cambodia, Lao P.D.R., Vietnam, Tajikistan, Uzbekistan, and Haiti. The group of CFA oil exporters includes: Cameroon, Chad, Congo (Republic of), Cote d'Ivoire, and Gabon.

Non-oil growth—a prerequisite for sustained poverty reduction—has also lagged behind that of comparator countries. While non-oil growth in CFA oil exporters has been only modestly lower than the net oil importers in the CFA zone, it has been significantly lower than in low-income countries with comparable levels of development, consistent with the more challenging business climate.

CFA Zone countries and Select LICs: Non-oil growth and development indicators[1]



Sources: IMF staff calculations, World Bank, Doing Business 2010, Transparency International.

[1] CFA oil exporters include: Cameroon, Chad, Congo (Republic of), Cote d'Ivoire, and Gabon. CFA non-oil exporters include: Benin, Burkina Faso, Central African Republic, Guinea-Bissau, Mali, Niger, Senegal, Togo. Low-income countries (LICs) include: Burundi, Comoros, Ethiopia, Gambia, Ghana, Guinea, Kenya, Madagascar, Malawi, Mauritania, Mozambique, Rwanda, Sierra Leone, Tanzania, Uganda, Zambia, Bangladesh, Cambodia, Lao P.D.R., Vietnam, Tajikistan, Uzbekistan, and Haiti.

III. Brief Literature Review

Given the size of oil wealth relative to their non-oil economies, the CEMAC countries are natural candidates to suffer from the "resource curse" phenomenon. The literature has documented that oil discoveries and oil price spikes lead to higher government spending, real exchange rate appreciation and a loss of competitiveness in the non-oil tradable sector (see for example Gelb, 1988; Everhart and Duval-Hernández, 2001). For LICs, one of the largest challenges associated with the study of Dutch disease is precisely the difficulty in determining how large the tradables sector would have been in the absence of the natural resources.

Empirical evidence on the role of the exchange rate generally suggests that substantial exchange rate overvaluation has a strong negative impact on growth (see Aguirre and Calderón, 2005; Razin and Collins, 1999; and Prasad, Rajan, and Subramanian, 2006). More recently, Rodrik (2008) and Berg and Miao (2010) stress the symmetric association of the real exchange rate with economic growth. The evidence they present shows that the overvaluation of the exchange rate is bad for growth, while undervaluation is growth-enhancing. While there is a consensus in the literature on the role the real exchange rate plays for economic growth, it can more accurately be described as a facilitating condition rather than a fundamental determinant (see Eichengreen, 2008, for a detailed discussion).[4]

Apart from the issue of exchange rate appreciation, in the case of less developed resource-rich countries, the study of the determinants of economic growth should take into account the structural problems that were present before the discovery of the natural resource and that persist long after the start of its exploitation. In this vein, a large body of literature has been devoted to how the wider institutional framework and its quality affect the growth outcomes of investment in developing countries. Theoretical and empirical work in this area has traditionally focused on investment quality, with more recent work incorporating the impact of institutional weakness and market inefficiency on growth (Barro, 1990; Barro and Sala-i-Martin, 2004; Rodrik, 2008; and Chakraborty and Dabla-Norris (2009).

More recently, Rodrik (2008) and Chakraborty and Dabla-Norris (2009) incorporate market inefficiencies and institutional weaknesses in standard growth models and stress their growth deterring impact. For example, Chakraborty and Dabla-Norris (2009) show how inefficient and corrupt bureaucracies interact with the provision of public investment thus diminishing the quality of public capital and private agents' incentives to invest. Rodrik's (2008) growth model allows for the study of the impact of market imperfections and institutional quality on GDP growth by incorporating in a standard growth model an "effective" tax rate on private investment and earnings. The assumption is that private investors and producers can retain only a share of their investment return and the value of producing the goods.

Regarding the role of investment quality, the theoretical literature on endogenous growth models has stressed the importance of the efficiency and quality of investment (total investment, or disaggregated into private and public investment) for its growth impact. Barro (1990) and Barro and Sala-i-Martin (2004) show how productive public investment raises

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[4] The facilitating role of the exchange rate refers to the fact that keeping the exchange rate competitive and avoiding excess volatility facilitates the growth-enhancing potential of the fundamentals. Eichengreen (2008) provides a detailed discussion of the link between the real exchange rate and growth, as well as the potential and limitations of policy interventions.

long-term growth by driving up the returns to other factors of production. To address the role of public services (i.e., publicly financed infrastructure, enactment of property rights, rule of law, and investment in human development), government purchases of goods and services enter the non-oil production function as productive public goods and complements to the private productive inputs. It is this productive role that can create a positive linkage between oil resources and economic growth.

There is broad consensus in the empirical literature of the positive impact of public investment on GDP growth. For example, Easterly and Rebelo (1993) show that general government investment is consistently positively correlated with both growth and private investment. More importantly, using sector-specific investment data the study shows that the share of public investment in transport and communication is robustly correlated with growth. Following this earlier study, a large number of empirical studies have investigated the link between investment (or more specifically public investment) and economic growth. A comprehensive survey of the empirical literature by Straub (2008) focuses specifically on infrastructure investment and concludes that two-thirds of empirical studies published in the period 1990–2007 find a positive and significant link between infrastructure and growth.[5] Studies using data on public capital stocks find significant positive effect of public capital on economic growth (see for example Calderon and Serven, 2008).

IV. THE MODEL

In order to identify the factors impacting non-oil GDP growth, we develop a tractable model that reflects the production structure of the CFA oil producing countries. The model is a general equilibrium model of a small open economy with an oil exporting sector and two non-oil productive sectors: a tradable and a non-tradable sector. Oil production is modeled as exogenous. We derive a closed form solution for the non-oil GDP growth rate.

In order to capture the role of public goods and services in enhancing non-oil growth, we extend the model in Rodrik (2008) in two ways: first, we incorporate productive government spending following Barro and Sala-i-Martin (2004) and Barro (1990), and second, we incorporate the efficiency of public goods. The government receives income from oil and purchases goods and services which enter the non-oil production function as productive public goods which are complements to private productive inputs. This productive role of public goods creates a positive linkage between oil resources and economic growth.

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[5] Straub (2008) surveys 64 articles in refereed journals in the period 1990–2007. While two-thirds of the empirical studies find a positive and significant association between infrastructure investment and growth, certain questions regarding policy implications (such as the optimal spending levels at different stages of development, impact of infrastructure investment on development gaps in different regions within countries, or between urban and rural areas) have been more difficult to answer.

The model also allows for the study of the impact of market imperfections on non-oil GDP growth. We incorporate these factors in the model by introducing an effective tax rate on private investment and non-oil earnings. Specifically, we assume that private investors and producers can retain only a share of their investment return and the value of producing the goods.

Consumption:

Households maximize their expected lifetime utility with preferences over a single final good that is produced by the non-oil sector using traded and non-traded inputs:

$$\max \sum_{t=0}^{\infty} \beta^t \log(c_t) \tag{1}$$

where c_t is consumption and β is the discount rate. Households supply capital to firms and make investment decisions. The budget constraint is:

$$c_t + k_{t+1} = (r_t + 1 - \delta)\, k_t \tag{2}$$

Maximizing (1) subject to (2) leads to the familiar intertemporal optimality condition:

$$\frac{c_{t+1}}{c_t} = \beta\,(r_{t+1} + 1 - \delta) \tag{3}$$

Production

The final consumption good is produced in the non-oil sector using tradable and non-tradable inputs (y_t^T and y_t^N respectively), under a constant returns to scale Cobb-Douglas production function:

$$y_t = (y_t^T)^{\alpha}\,(y_t^N)^{1-\alpha} \tag{4}$$

Traded and non-traded inputs are produced using private capital k_t^T and k_t^N, and public goods s_t:

$$y_t^T = A_T\,(k_t^T)^{\phi}\,(\gamma\, s_t)^{1-\phi} = A_T\,\theta_T^{\phi}\,k_t^{\phi}\,(\gamma\, s_t)^{1-\phi} \tag{5}$$

$$y_t^N = A_N\,(k_t^N)^{\phi}\,(\gamma\, s_t)^{1-\phi} = A_N\,(1-\theta_T)^{\phi}\,k_t^{\phi}\,(\gamma\, s_t)^{1-\phi} \tag{6}$$

where θ_T is the share of total private capital allocated to the production of tradables, ϕ is the private capital share in the production of both tradable and non-tradable inputs, and A_N and A_T are the levels of technology.

The inclusion of public goods s_t in the production function follows Barro (1990) and Barro and Sala-i-Martin (2004). Public goods are defined in the broad sense to include physical infrastructure (roads and highways), communications and water systems, property rights, law and order, and contributions to human capital development. We assume that these goods and services are provided by the government without charge and are not subject to congestion effects. The productive share of government spending that enters the production function is measured by the quantity of government purchases of goods and services. Conceptually, as outlined in detail in Barro (1990), this is equivalent to assuming that the government does not do any production on its own and does not own capital, rather it buys a flow of output which it makes available to private producers. For the private producers, these purchases constitute inputs available to the production of goods. The efficiency of public spending is captured by the parameter γ.

The tradable and non-tradable goods are produced competitively. Given that public goods financed solely by oil revenue are provided without charge and private sector use of public goods does not reduce the stock of available public services (no congestion), the optimization is achieved by choosing the level of private capital while holding s_t fixed.

As can be seen in equations (5) and (6), public goods produce externalities in the production of both tradable and non-tradable goods—the production function specification generates endogenous growth. Following Barro and Sala-i-Martin (2004), we assume that the government chooses a constant ratio of its productive purchases to GDP: s/y. When s_t/y_t is constant, the marginal product of capital is invariant to the stock of capital k_t. The constant marginal product of capital delivers a standard AK type growth model where the growth rates of c_t, k_t and y_t are equal. We can determine this common growth rate from the expression of consumption growth.

Using the first order conditions for the two sectors and the fact that in equilibrium the marginal productivities across sectors are equalized, the non-oil GDP growth rate can be expressed as follows:

$$g_t = \beta \left[\phi \left(\gamma \frac{s}{y} \right)^{\frac{1-\phi}{\phi}} A_T^{\frac{\alpha}{\phi}} A_N^{\frac{(1-\alpha)}{\phi}} \theta_T^{\alpha} (1-\theta_T)^{(1-\alpha)} + 1 - \delta \right] \tag{7}$$

As is apparent from equation (7), the non-oil growth rate depends positively on the share of public goods in total output that are used for productive purposes s/y and on the efficiency of public spending γ. The productive use of public goods is growth enhancing. Moreover, g is monotonically increasing in s/y, because a higher s/y shifts upward the marginal product of capital. Since households do not pay taxes, households respond to the higher product of capital by choosing a higher growth rate for consumption.

Market imperfections

Next, we take into account the market imperfections that are prevalent in the CEMAC member countries. We model these imperfections following Rodrik (2008) by assuming that firms can only retain a share $(1 - \tau_f)$ of the value of the goods they produce, and similarly, households can only retain a share $(1 - \tau_k)$ of the capital income from their investment in the firms. Then τ_f and τ_k can be interpreted as the effective tax rates that firms and households face, respectively. For the purposes of the model it is not important to distinguish between different types of market and institutional weaknesses.

We can now derive effective marginal product of capital $\tilde{r}_t$ as:

$$\tilde{r}_t = (1 - \tau_k)(1 - \tau_f)\, r_t \tag{8}$$

Equation (8) shows that market imperfections lower the marginal product of capital. As a result, the growth equation can be written as:

$$\tilde{g}_t = \beta \left[(1 - \tau_k)(1 - \tau_f)\, \phi \left(\gamma \frac{s_t}{y_t} \right)^{\frac{1-\phi}{\phi}} A_T^{\frac{\alpha}{\phi}\phi} A_N^{\frac{(1-\alpha)}{\phi}} \theta_T^{\alpha} (1 - \theta_T)^{(1-\alpha)} \right] \tag{9}$$

It is clear from equation (9) that the introduction of market imperfections leads to lower non-oil growth.

The real effective exchange rate

Although the exchange rate does not enter directly into the growth equations, it nevertheless plays an indirect role. We follow closely Rodrik (2008) to emphasize the role of the exchange rate. The relative price of the traded goods $R = \frac{p_T}{p_N}$ is the index of the real exchange rate in the model.

First, we explore how the exchange rate affects the allocation of capital across the two sectors by exploring the investment incentives in the intermediate sectors that produce the traded and non-traded inputs. Equating the marginal products of capital in the traded and non-traded sectors gives the following relationship:

$$\left(\frac{\theta_T}{1 - \theta_T} \right)^{\phi - 1} = \frac{1}{R} \frac{A_N}{A_T} \tag{10}$$

Equation (10) shows a positive relationship between the share of capital allocated to traded goods sector θ_T and the real exchange rate R. This is the supply side relationship between the exchange rate and θ_T.

Second, we explore how the exchange rate affects the demand for the traded and non-traded inputs in the production of the final good. From the demand of the two inputs in the production of the final good, we can derive the following relation:

$$\left(\frac{\theta_T}{1-\theta_T}\right)^{\phi} = \left(\frac{\alpha}{1-\alpha}\right)\frac{1}{R}\frac{A_N}{A_T} \tag{11}$$

Equation (11) shows the negative relationship between the share of capital allocated to traded goods sector θ_T and the real exchange rate R: an increase in R makes traded goods more expensive and therefore reduces the demand for capital in the traded goods sector θ_T. This is the demand side relationship.

Rodrik (2008) shows that in equilibrium the return to capital and growth are maximized when $\theta_T = \alpha$, that is when the share of capital allocated to the traded goods intermediate sector equals the final good output elasticity of the traded input.

V. Empirical Investigation

In the theoretical section we showed that the productive use of public resources and the efficiency of investment are key ingredients for non-oil growth, with the real exchange rate impacting growth indirectly through the role it plays in the allocation of capital across sectors. In what follows we test these theoretical predictions for the CFA oil exporting countries and explore to what extent these countries differ from countries with comparable levels of development that are not highly dependent on oil or mineral resources.

We estimate a growth equation using a panel with country and time fixed effects:

$$g_{it}^{n} = \alpha_0 + \alpha_1 \, ln \, R_{it} + \alpha_{\mathbf{2}} \, \mathbf{X}_{it} + \alpha_3 \, D^{CFA\,oil} \, \mathbf{X}_{it} + \alpha_t + \alpha_i + u_{it} \tag{12}$$

where g_{it}^{n} is real non-oil GDP growth and X_{it} is a vector of standard growth determinants such as initial income, investment share of output, share of government consumption in output, terms of trade, and a measure of openness to trade. $D^{CFA\,oil}$ is a dummy variable for the CFA oil exporters.[6] The interaction term $D^{CFA\,oil}\,\mathbf{X}_{it}$ captures whether and how CFA oil exporters differ from the rest of the sample with regard to the way the standard growth determinants affect non-oil growth. The net impact of X_{it} on growth for the CFA oil exporters is captured by $\alpha_2 + \alpha_3$. The fixed effects framework implies that we estimate changes in the explanatory variables on changes in growth rates within countries. The time and country fixed effects are captured by the terms α_t and α_i, respectively.

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[6] We do not estimate the direct impact of market weaknesses on growth since as the theoretical model above shows, these will manifest themselves through the effectiveness of investment in spurring growth.

In equation (12) R_{it} is a measure of the real exchange rate. Following Rodrik (2008) and Berg and Miao (2010), we include R_{it} directly in the non-oil GDP growth equation. Following Rodrik (2008), Delechat et al (2009), and Berg and Miao (2010), we define R_{it} as the deviation of the actual real exchange rate from its PPP value, adjusted for the effects of per capita income on the real exchange rate. The exchange rate over/under-valuation is then the residual in a regression of the real exchange rate on per capita income: ϵ_{it}^{ppp}.

$$\ln \mathrm{RER}_{it} = \alpha_0 + \alpha_1 \ln y_{it} + \alpha_t + \epsilon_{it}^{ppp} \tag{13}$$

This measure has the advantage that it is directly comparable across countries. The dependent variable $\ln \mathrm{RER}_{it}$ in (13) is the log of the ratio of the market exchange rate to the PPP conversion factor; the log of per capita GDP $\ln y_{it}$ accounts for the Balassa-Samuelson effect. Subscript t denotes the 3-year average period, and i denotes the country. The set of time fixed effects is captured by α_t. We follow the literature and estimate equation (13) for 181 countries that have data available for the entire period (see Rodrik, 2008, Delechat et al. (2009).

Turning to the estimation of equation (12), the dependent variable is real non-oil GDP growth, measured as log difference. We include initial income, measured as the log of real GDP per capita in constant 2000 USD, to control for the Balassa-Samuelson effect. Openness to trade is defined as (Exports + Imports)/GDP, government consumption is measured as public consumption expenditure as a share of total GDP, and investment refers to gross fixed capital formation as a share of total GDP. The source of data is WEO, the time period covered is 1985-2008, and all variables are 3-year averages as is common in the literature to account for business cycle fluctuations.

Ideally, we would assess the role of the stock of capital on non-oil growth, which would be in line with the theoretical model presented in the previous section. Constructing capital stocks, however, is non-trivial, especially for LICs and post-conflict countries, and requires a number of important assumptions regarding initial capital stocks, the level and time profile of depreciation rates, and the depreciation method.[7] Rather than constructing stock of capital across countries we follow the empirical growth literature that uses instead investment rates (see for example Ramey and Ramey, 1995; Miao and Berg, 2010). Consequently, our empirical estimates do not explicitly take into account the efficiency of converting investment into capital.

As control groups to the CFA zone oil exporters we use (i) the CFA non-oil exporters and (ii) a sample of select low-income countries; in total, the final sample contains 38 countries

[7] See, for example, Klenow and Rodriguez-Clare's (1997) analysis of the neoclassical growth model, in which they measure capital stocks by accumulating investment data in the Penn World Tables.

(excluding Equatorial Guinea) and 270 observations.[8] While for the baseline specifications we use $\ln R_{it} \equiv \epsilon_{it}^{ppp}$, as a robustness check we also use the log of the real effective exchange rate REER_{it} as an alternative measure of the exchange rate.

As a starting point, Table 1 column 1 reports the results of a standard growth specification for the entire sample of 38 countries that does not distinguish among the three country groups. The specification is therefore a simplification of equation (12) where we ignore the interaction terms $D^{CFA\,oil}\,\mathbf{X}_{it}$. It closely follows Berg and Miao (2010) and the results confirm their findings, both in terms of magnitude and significance of the coefficients. Our results are also consistent with recent empirical studies that have documented that for developing countries exchange rate overvaluations are associated with lower growth rates (Rodrik, 2008; Berg and Miao, 2010). The estimates for the exchange rate measures suggest that a 10 percent overvaluation is associated with 0.25 percentage points lower growth rate. The estimates for investment and government consumption imply that a 1 percentage point increase in the share of investment in total GDP is associated with 0.127 percentage points higher growth, while a 1 percentage point increase in the share of government consumption in total GDP is associated with 0.076 percentage points lower growth. While it is common in the literature to include government consumption or investment shares in GDP growth regressions, the endogeneity problem can be non-trivial and results may reflect to a certain extent reverse causality (see for example Berg and Miao, 2010). The same issue applies to the inclusion of the real exchange rate in the growth regression. One might address this concern by a dynamic panel estimation using GMM (see Arellano and Bond, 1991).

Reassured by findings for the panel as a whole that are consistent with the empirical findings in the literature, we proceed to investigate the factors that have led to lower non-oil growth in the CFA zone oil exporting countries. The results in Table 1 column 2 imply that although on average investment is positively and significantly associated with growth for the sample as a whole, *for the CFA oil exporters investment is not related to growth in a statistically significant way*. The coefficient on the interaction term in column 2 shows that for the CFA oil exporting countries the impact of investment as a share of GDP on non-oil growth differs significantly from the impact it has for the rest of the countries in the sample. The net impact for the CFA oil exporters ($\alpha_2 + \alpha_3$) is -0.005 and a Wald test shows that this net coefficient is not statistically significant. The results in column 3 show that *the lack of a significant relation between investment and non-oil growth for the CFA oil exporters is also evident when we control separately for the CFA non-oil countries*. Similar to the results in column 2,

[8] The group of CFA oil exporters includes: Cameroon, Chad, Congo (Republic of), Cote d'Ivoire, and Gabon. The group of CFA non-oil exporters includes: Benin, Burkina Faso, Central African Republic, Guinea-Bissau, Mali, Niger, Senegal, and Togo. The group of low-income countries (LICs) includes: Burundi, Comoros, Ethiopia, Gambia, Ghana, Guinea, Kenya, Madagascar, Malawi, Mauritania, Mozambique, Rwanda, Sierra Leone, Tanzania, Uganda, Zambia, Bangladesh, Cambodia, Lao P.D.R., Vietnam, Tajikistan, Uzbekistan, and Haiti.

the net effect of investment for the CFA oil exporters -0.004 and a Wald test shows it is not statistically different from zero. Column 3 shows that for the group of CFA non-oil exporters the net effect of investment is positive and significant at the 1 percent level, although at 0.07 it is much lower than the estimate for the average low-income country in the sample.

Next, as a robustness check we use the log of the real effective exchange rate REER_{it} as a measure of the exchange rate. Table 2 shows that the results do not change and are therefore robust to alternative measures of exchange rate. The estimates for the exchange rate measures suggest that a 10 percent overvaluation or a 10 percent increase in the real effective exchange rate (REER) are associated with a 0.3 percentage points lower growth rate.

Turning to the composition of investment, since the oil revenues accrue to the governments of the oil exporting countries in the CFA zone and public investment constitutes the majority of total investment in these countries, we disaggregate investment into private and public investment as a share of GDP.[9] The results are shown in Table 3.

For the sample as a whole, the positive association between both public and private investment and growth is preserved (Table 3 column 1). However, *for the CFA oil exporters we fail to detect any significant association between non-oil growth and either public or private investmen*t: the net coefficients are -0.088 and 0.014, respectively, and a Wald test indicates that neither is statistically significant from zero (Text Table 1). The insignificant coefficient on the interaction term of the CFA non-oil exporters dummy with public investment means that the relation between public investment and growth in these countries does not differ from that found for the average low-income country in the sample (0.19).

Text Table 1. Impact of investment on non-oil growth

	Total investment		Public investment		Private investment	
	Coefficient	p-value (Wald test)	Coefficient	p-value (Wald test)	Coefficient	p-value (Wald test)
Select LICs	0.211**	0.018	0.191*	0.069	0.223**	0.032
	positive and significant		*positive and significant*		*positive and significant*	
CFA zone non-oil exporters	0.068***	0.008	0.180*	0.03	0.017	0.697
	positive and significant		*positive and significant*		*positive but insignificant*	
CFA zone oil exporters	-0.004	0.899	-0.088	0.516	0.014	0.612
	negative but insignificant		*negative but insignificant*		*positive but insignificant*	

[9] Public investment is gross public fixed capital formation as a share of total GDP; private investment is gross private fixed capital formation as a share of total GDP. During the estimation period, private investment in the CFA oil exporting countries was mainly in the oil sector, while public investment was in infrastructure.

To address the importance of the exchange rate and the recent empirical literature on the role of the exchange rate for GDP growth in developing countries, we also estimate all the specifications including an interaction term with either measure of the exchange rate (undervaluation index or the REER). This allows us to see whether the real exchange rate impacts growth in the three country groups a significantly different way. The results (not shown) indicate that *there is no statistically significant difference in the way the real exchange rate is associated with GDP growth in the three country groups*.

Turning to investment efficiency, in a recent study Dabla-Norris et al. (2011) construct an index of the efficiency of the public investment management process for 71 developing countries. The efficiency of public investment is proxied by aggregate indicators of the quality and efficiency of four crucial stages of the investment process: investment project appraisal, selection, implementation, and evaluation. While the focus of this index is on the quality of the process for managing public investments and the index is not available for all countries in our empirical investigation, it nevertheless provides a useful benchmark for our empirical findings. In terms of country comparisons, our results are broadly in line with the rankings based on this new index. Notably, all but one of the CFA oil exporting countries for which the index is available rank among the weakest performers.

VI. Conclusions

Using a panel of 38 countries comprising LICs and CFA zone oil exporters, we find that controlling for the real effective exchange rate, there is a failure of investment in oil producing countries of the CFA zone in spurring growth. For LICs outside of the CFA zone, *private* investment is found to have a fairly large, positive and statistically significant impact on growth, while *public* investment has a somewhat weaker impact on growth. For CFA zone non-oil producers, the impact of *public* investment on growth is lower than in other LICs but positive and significant. In contrast, for CFA zone oil producers, we fail to detect a significant association between non-oil growth and public investment. For both groups within the CFA zone, the impact of *private* investment is not statistically significant.

There are many reasons why investment may not raise non-oil growth in the oil exporting countries of the CFA zone. First, investment itself may be less efficient due to project selection and/or capacity constraints related to project appraisal, implementation and monitoring. Second, it is likely that the necessary conditions for public investment to spur private sector activity are not in place. Such conditions include basic infrastructure (above a required threshold level), an enabling business environment and strong institutions and governance. These conclusions are supported by our theoretical model which demonstrates that public goods are growth enhancing, while weak institutions and market imperfections impede growth.

Table 1. Growth and Total Investment: Estimation Results

	(1)	(2)	(3)
Non-oil growth (lagged)	0.007	-0.005	-0.010
	(0.06)	*(0.06)*	*(0.06)*
UNDERVAL (ln)	0.025**	0.025**	0.028***
	(0.01)	*(0.01)*	*(0.01)*
Initial income (ln)	-0.078***	-0.078***	-0.081***
	(0.02)	*(0.02)*	*(0.02)*
Terms of trade (ln)	0.007	0.009	0.012
	(0.01)	*(0.01)*	*(0.01)*
Openness	0.004	0.007	0.003
	(0.02)	*(0.02)*	*(0.02)*
Investment	0.127***	0.154***	0.211***
	(0.04)	*(0.05)*	*(0.09)*
Gov. Consumption	-0.076**	-0.095**	-0.134**
	(0.04)	*(0.04)*	*(0.07)*
CFA^{oil} * Investment		-0.159***	-0.215***
		(0.04)	*(0.08)*
$CFA^{non\text{-}oil}$ * Investment			-0.143*
			(0.09)
Adjusted R^2	0.28	0.29	0.30
Observations	270	270	270

Dependent variable: real non-oil GDP growth. Panel estimation with time and country fixed effects. Heteroscedasticity-consistent standard errors in parentheses. ***(1%), **(5%), *(10%).

Table 2. Growth and Total Investment Robustness Check: Estimation Results Using the Real Effective Exchange Rate (REER) versus the PPP Undervaluation Index

	(1)	(2)
Non-oil growth (lagged)	-0.024	-0.010
	(0.07)	*(0.06)*
REER (ln)	-0.027***	
	(0.01)	
UNDERVAL (ln)		0.028***
		(0.01)
Initial income (ln)	-0.080***	-0.081***
	(0.02)	*(0.02)*
Terms of trade (ln)	0.010	0.012
	(0.01)	*(0.01)*
Openness	0.001	0.003
	(0.02)	*(0.02)*
Investment	0.206***	0.211***
	(0.07)	*(0.09)*
Gov. Consumption	-0.131**	-0.134**
	(0.05)	*(0.07)*
CFA^{oil} * Investment	-0.211***	-0.215***
	(0.06)	*(0.08)*
$CFA^{non\text{-}oil}$ * Investment	-0.141*	-0.143*
	(0.08)	*(0.09)*
Adjusted R^2	0.31	0.30
Observations	270	270

Dependent variable: real non-oil GDP growth. Panel estimation with time and country fixed effects. Heteroscedasticity-consistent standard errors in parentheses. ***(1%), **(5%), *(10%).

Table 3. Growth and Investment: Estimation Results When Investment Is Disaggregated into Public and Private Investment

	(1)	(2)
Non-oil growth (lagged)	-0.002	-0.018
	(0.07)	*(0.07)*
UNDERVAL (ln)	0.026**	0.029**
	(0.01)	*(0.01)*
Initial income (ln)	-0.078***	-0.081***
	(0.02)	*(0.02)*
Terms of trade (ln)	0.008	0.013*
	(0.01)	*(0.01)*
Openness	0.003	0.003
	(0.02)	*(0.02)*
Private Investment	0.129**	0.223**
	(0.05)	*(0.10)*
Public Investment	0.117*	0.191*
	(0.06)	*(0.10)*
Government Consumption	-0.078*	-0.145*
	(0.04)	*(0.07)*
CFA^{oil} * Private Investment		-0.209**
		(0.09)
CFA^{oil} * Public Investment		-0.279*
		(0.16)
$CFA^{non-oil}$ * Private Investment		-0.206*
		(0.12)
$CFA^{non-oil}$ * Public Investment		-0.011
		(0.13)
Adjusted R^2	0.28	0.30
Observations	270	270

Dependent variable: real non-oil GDP growth. Panel with time and country fixed effects. Heteroscedasticity-consistent standard errors in parentheses. ***(1%), **(5%), *(10%).

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