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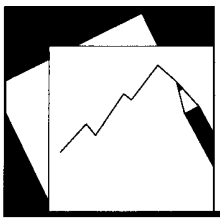

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Oil and Growth in the Republic of Congo

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Abstract

This paper investigates the linkages between oil and growth in Congo, where there appears to be no evidence of direct spillover effects. The empirical results suggest however that political instability has a negative effect on non-oil growth, and that the presence of oil could have fueled political instability by being associated with weakening institutions. The results also show that fiscal discipline is beneficial for growth. In addition, there are strong linkages between world oil prices and the real effective exchange rate, with movements in the latter having important indirect repercussions for growth.

JEL Classification Numbers: O4; O55

Keywords: Oil, conflicts, economic growth

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I. INTRODUCTION

The Republic of Congo (hereafter "Congo")[2] is the fifth-largest oil producer in sub-Saharan Africa. Once classified as a lower-middle-income economy, Congo experienced an almost continuous decline in per capita income between 1985 and 2000. This negative trend took place in the context of an overvaluation of the CFA franc in the second half of the 1980s and early 1990s, an acceleration of rural-urban migration in the 1980s, and three successive civil conflicts in the 1990s. In addition, Congo's debt burden became very heavy in the 1990s and may have exerted an additional constraint on growth.

Congo was under a socialist one-party system and the economy was centrally planned during 1964–90. The transition to a democratic state came through a tumultuous, conflict-ridden phase in the 1990s; three successive and intense conflicts destroyed physical capital, displaced thousands of individuals, and further weakened institutions. Against this background, recent political developments are encouraging. Under the umbrella of peace, Congo completed a four-year political transition, held democratic elections, and installed the full complement of democratic institutions required by its constitution.

The Congolese economy is dominated by the oil sector, which, in 2004, accounted for over 50 percent of GDP, more than 70 percent of government revenues, and almost 85 percent of merchandise exports. Oil production is mainly located offshore and managed by joint ventures between international companies and the national oil company (Société Nationale des Pétroles du Congo, SNPC). Ancillary oil-related services are dominated by international groups, and the bulk of their supplies are imported.

The non-oil sector is a mixture of forestry, traditional agriculture, services, and a relatively large public administration, which accounts for close to one-fifth of the non-oil economy. The services sector constitutes about 60 percent of non-oil GDP, followed by agriculture and forestry (18 percent), and industry and mining (around 11 percent). Transport and communications, forestry, and industry and mining have been growing rapidly in recent years.

This paper investigates the linkages between oil and growth in Congo during 1960–2004. It also examines empirically how a natural resource (oil) affects, not just overall growth, but also growth in the non-oil sector, both directly and indirectly through its impact on the real effective exchange rate. Most empirical studies have used cross-section data to investigate the linkages between natural resources and growth. This paper uses time-series data to investigate these linkages in Congo, where the share of oil in value-added increased from around 4 percent in 1970 to about 50 percent in 2004.

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[2] Congo is a member of the French franc zone. Its currency, the franc de la Communauté Financière en Afrique Centrale (the CFA franc), is issued by the Banque des Etats de l'Afrique Centrale (BEAC) and is pegged to the euro. The exchange rate of the CFA franc has been fixed against the French franc since 1948, and was devalued by 50 percent in January 1994. Since January 1999, the CFA franc has been pegged at €1 = CFAF 655.957.

The empirical results presented in this paper do not provide evidence that development of the oil sector has had any significant direct effects (positive or negative) on growth of the non-oil sector. However, there are at least two ways in which the oil sector may have indirectly affected non-oil growth. First, the empirical results suggest that political instability has a significant negative effect on growth of the non-oil sector. The presence of oil, in turn, could have fueled political instability in a number of ways, most importantly by being associated with weakening institutions and rising corruption in government, and by providing a source of finance to rebel groups. Second, the empirical results show a strong link between the price of oil in world markets and the real effective exchange rate, both in the short run and in the long run, and appreciations in the real effective exchange rate, in turn, have important adverse implications for both total and non-oil GDP growth.

The rest of this paper is organized as follows: Section II outlines the recent political and economic developments in the political and security situation; Section III reviews economic performance during 1970–2004, including in the context of IMF-supported programs; Section IV provides some background on the role that the oil sector has played in the Congolese economy; Section V reviews the literature on natural resources and economic growth; Section VI discusses and estimates growth in the context of Congo; Section VII estimates models for the real effective exchange rate; and Section VIII presents conclusions.

II. Political and Security Situation

A. Background[3]

After three relatively peaceful, but coup-ridden, decades of independence, Congo experienced three intense conflicts in the 1990s (1993, 1997, and 1998–99). Following an already turbulent first half of the 1990s, due principally to disputes over elections, political turmoil intensified after 1996 and two civil wars (in 1997 and late 1998) ravaged the southern part of the country. These conflicts reflected, in various combinations, armed opposition between the regular armed forces and three main militias (the "Cobras" of President Denis Sassou Nguesso, the "Coyotes" and the "Zulus" of the former President, Pascal Lissouba, and the "Ninjas" of Bernard Kolelas and Pastor Ntumi). More specifically:

- Fighting erupted in 1993 when disputed parliamentary elections led to ethnic-based fighting between pro-government forces and the opposition. After a cease-fire agreement in 1994–95 some opposition members were included in the government.

- In 1997, ethnic and political tensions exploded into a full-scale civil war, fueled in part by the prize of the country's offshore oil wealth, which may have motivated warlords.

- The conflict of December 1998–October 1999 affected mainly the southern part of the country. Following the 1998–99 conflict, a cease-fire agreement was signed in late 1999 that provided for a national dialogue, demilitarization of political parties, and the reorganization of the army, including the readmission of rebel units into the

[3] A major source for this section my be found via the Internet at: http://news.bbc.co.uk/1/hi/world/africa/country_profiles/1076794.stm.

security forces.

B. Recent Developments

The national dialogue that followed the 1999 cease-fire offered an opportunity for drafting a new constitution in 2001. Postwar reconstruction was undertaken, along with the reintegration of former militiamen into the society, with the support of the international community. The new constitution, adopted by referendum in January 2002, strengthened the power of the president. Presidential, legislative, local and senatorial elections were held during March- July 2002, although the main political challengers and former leaders were excluded. The inauguration of President Sassou-Nguesso in August 2002 put a formal end to the transition period. Subsequently, a new government was empowered to implement a policy agenda popularly known as New Hope (*Nouvelle Espérance).*

Renewed rebel activity in 2002 dealt a setback to efforts to consolidate the peace and normalize politics, but on March 17, 2003, a new peace accord was signed that recommitted the government and the Ninja rebel group to the 1999 agreement. The political stability and military peace achieved in the aftermath of the 2002 elections and the 2003 peace accord were consolidated by the approval in August 2003 of amnesty for both rebel and government combatants, and the promulgation in November 2003 of a program for the demobilization, disarmament, and reintegration of former combatants.

With security restored in the Pool region (the area surrounding Brazzaville), the vital rail link between Pointe-Noire (the port city and economic capital) and Brazzaville (the administrative capital) became more reliable, and a concerted effort to improve the train service is underway. However, the security situation is still fragile. In April 2005 rebels attacked a UNDP convoy in the Pool region, though with no casualties, and in October 2005 skirmishes erupted in a suburb of Brazzaville following the return of a rebel leader.

III. Economic Performance Since 1970[4]

Per capita output development during 1970–2004 can be divided into three distinct sub-periods: 1970–84, when output grew almost continuously; 1985–99, when it declined significantly; and 2000–04, when it generally started to recover (Table 1; Figures 1-4). Notwithstanding the recent rise in output, per capita real GDP in 2003 was less than 75 percent of its level in 1984.

[4] The analysis in this section was primarily derived from previous IMF staff reports on Congo.

Table 1. Republic of Congo: Selected Economic and Social Performance Indicators, 1980-2004

	1980-84	1985-89	1990-94	1995-99	2000-04
National Accounts	(in percent, unless otherwise indicated)				
Per capita GDP (in 1995 US dollars)	982	979	883	796	795
Real GDP growth	14.3	-0.7	-0.1	1.7	4.2
Oil	12.5	9.3	3.8	9.1	-3.3
Non-oil	14.9	-3.3	-1.7	-2.8	9.6
Consumer price inflation	3.7	-2.8	9.0	7.4	1.9
	(in percent of GDP, unless otherwise indicated)				
Fiscal Accounts					
Total domestic revenue (excl. grants)	34.1	25.8	24.3	25.7	29.1
Primary expenditure and net lending [1/]	24.3	22.9	26.4	21.6	22.4
Basic primary budget balance	9.8	2.9	-2.2	4.2	6.7
External Sector					
Trade balance	23.3	25.6	24.3	40.1	53.3
External debt	89.6	176.6	217.5	236.9	180.8
Real effective exchange rate (index, 1990=100)	96.7	98.8	92.7	79.3	80.8
Terms of trade (index, 1990=100)	179.6	125.8	84.1	78.0	127.4
Oil price (U.S. dollars per barrel)	33.3	18.7	19.2	17.4	28.9
Social Indicators	(in units indicated)				
Adult illiteracy ratio (in percent of people ages 15 and above)	46	38	30	23	19
Secondary school enrollment ratio [2/]	74	75	54	53	42
Immunization ratio [3/]	50	70	67	33	31
Life expectancy at birth (in years)	50	51	51	51	51

Sources: Congolese authorities, and IMF staff estimates and calculations.

1/ Noninterest current expenditure plus domestically-financed investment.

2/ In percent of the children of secondary school age.

3/ In percent of children under 12 months for immunization against diphtheria, tetanus, and polio.

Figure 1. Republic of Congo: Per Capita Real GDP, 1960–2004
(Index, 1960=100)

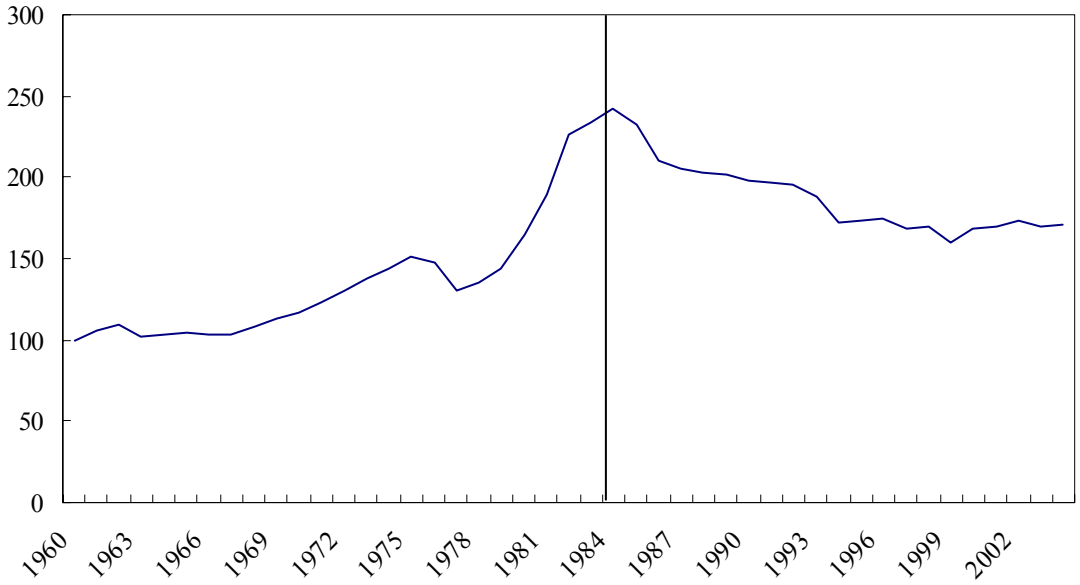
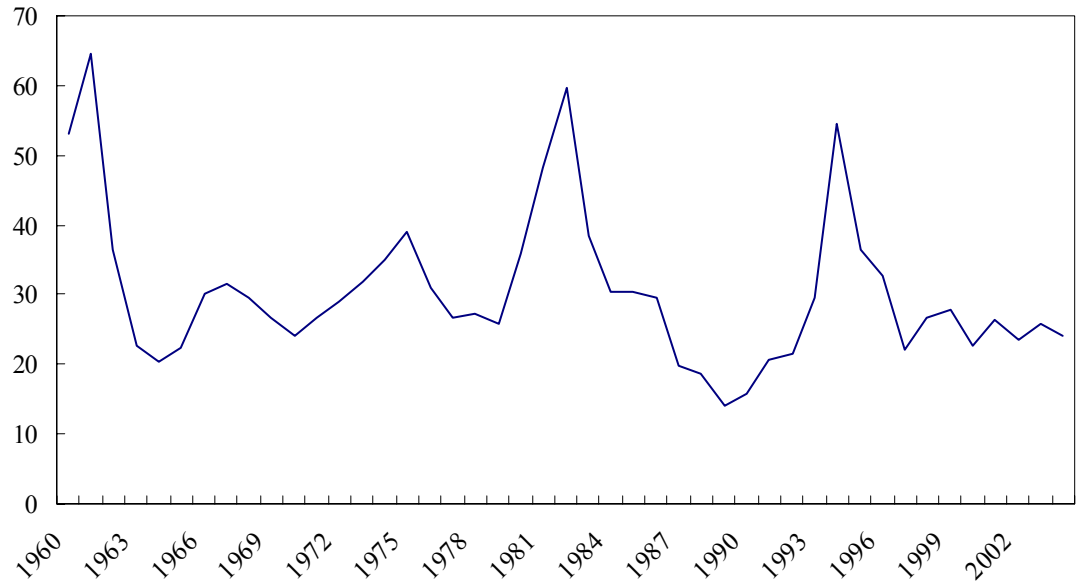


Figure 2. Republic of Congo: Domestic Investment, 1960–2004
(In percent of GDP)



Sources: World Bank, *World Development Indicators*; and IMF, *World Economic Outlook* databases.

Figure 3. Republic of Congo: Budgetary Performance, 1970–2004

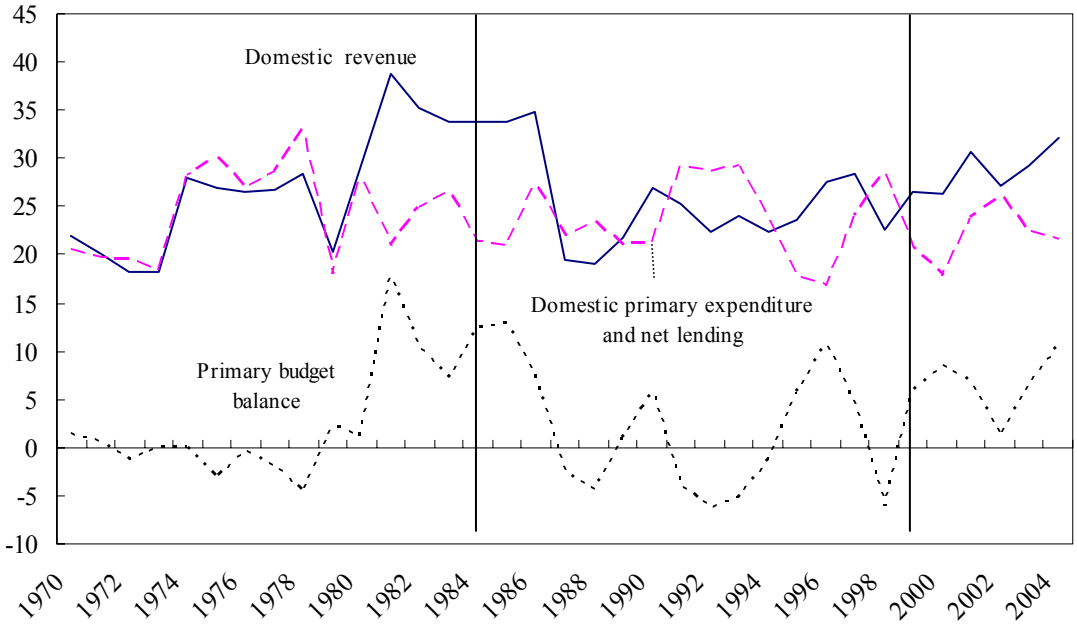
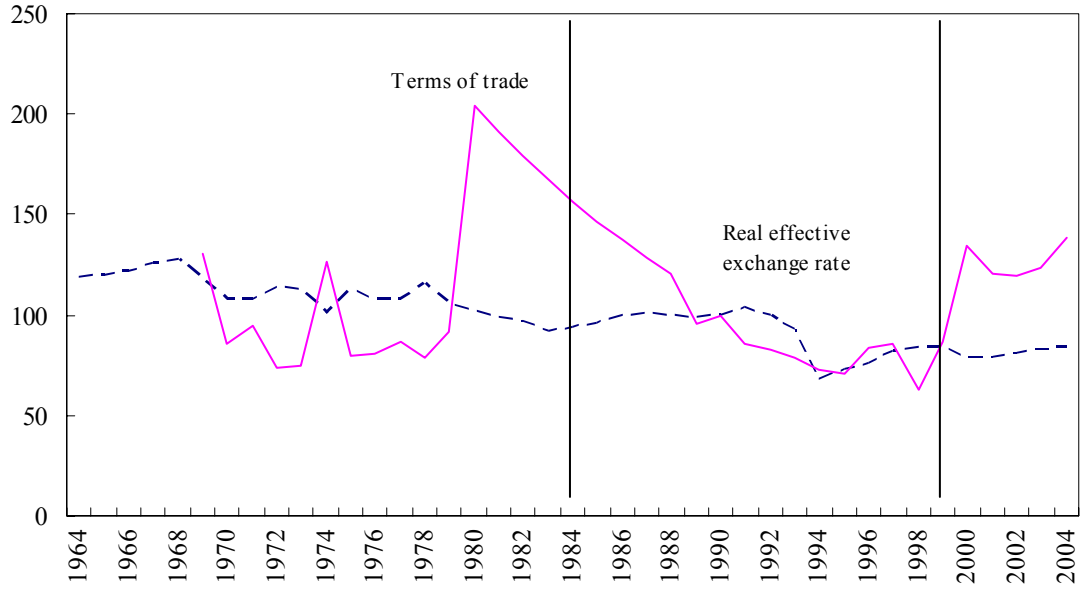


Figure 4. Republic of Congo: Terms of Trade and Real Effective Exchange Rate, 1964–2004 (Index 1990=100)



Sources: World Bank, *World Development Indicators*; and IMF, Information Notice System.

A. Output Expansion, 1970–84

Per capita real GDP doubled during this period, with three-fourths of the expansion stemming from the non-oil sector and the remainder from a rapidly developing oil sector. Oil prices rose from an annual average of US$17 per barrel during 1975-79 to about US$33 per barrel in the first half of the 1980s. In view of rising oil revenue, government investment increased by an annual average of 2 percentage points of GDP between 1970-74 and 1975-79. Heavy emphasis was given to schooling, and employment was virtually guaranteed for high school and university graduates either in the civil service or in state enterprises. This resulted in serious overstaffing in the government administration and public enterprises.

The Congolese authorities adopted in 1981 an ambitious Five-Year Economic and Social Development Plan, underlying which was an overly expansionary fiscal policy path. Government investment rose by an annual average of 15 percentage points between the second half of the 1970s and the first half of the 1980s.

Even though current expenditure was curtailed, the domestic financial imbalances, which had widened in the second half of the 1970s, continued to deteriorate in the first half of the 1980s. In addition, the country's external indebtedness, which had been growing rapidly in the 1970s and early 1980s to finance domestic investment projects, doubled between 1980-84 and 1985-89.

B. Output Collapse, 1985–99

The rapid rise in the public sector during the oil boom years of the early 1980s, including in the form of massive public employment creation, partly provided the seeds for the subsequent long decline in output. The oil bonanza came to an end in the second half of the 1980s, when oil prices declined to an annual average of about US$18½ per barrel during 1985-89 (from an annual average of about US$33 per barrel during 1980-84). In view of the associated significant decline in oil revenues, the government took internal adjustment measures, including in the context of a 20-month Stand-By Arrangement launched in August 1986.

However, the government's policy response to the collapse in the terms of trade in the second half of the 1980s was slow and limited, relying mainly on cuts in government investment spending and limited structural reforms. As a result, economic activity stagnated, public sector and external imbalances widened markedly, and the external public debt and debt-service burdens grew to unsustainable levels. In addition, large domestic and external payment arrears accumulated. The CFA franc became overvalued in the early 1990s because, even though the terms of trade had declined almost secularly between 1980-84 and 1990-94, the real effective exchange rate remained virtually unchanged.

Given the magnitude of the macroeconomic imbalances in the late 1980s and early 1990s, it became clear by 1993 that strategies based solely on internal adjustments would be insufficient to restore external competitiveness, as nominal domestic prices showed considerable downward rigidity. The adjustment strategy was broadened in January 1994, with a 50 percent devaluation of the CFA franc—decided at the CFA franc zone level—to restore competitiveness and boost exports. Successive economic programs supported by the IMF went off track, owing to political instability, weak fiscal discipline and insufficient resolve to implement structural reforms, especially in the oil sector.

C. Recent Output Recovery, 2000–04

The onset of peace in 1999–2000 boosted economic activity and contributed to macroeconomic stability. Non-oil real GDP increased by about 9½ percent per annum on average during 2000-04. Consumer price inflation has been brought under control, helped by a more reliable supply line from Pointe-Noire to Brazzaville and a strengthening of the euro, although sporadic attacks on the railway during the last few months of 2004 led to a spike in inflation. The overall fiscal situation has been improving, and important steps have been taken to enhance transparency in the oil sector and to strengthen public finance management. Progress on both the political and economic fronts led to the Executive Board of the International Monetary Fund approving a three-year arrangement under the Poverty Reduction and Growth Facility (PRGF) for the Republic of Congo in December 2004.

IV. The Role of Oil in Congo

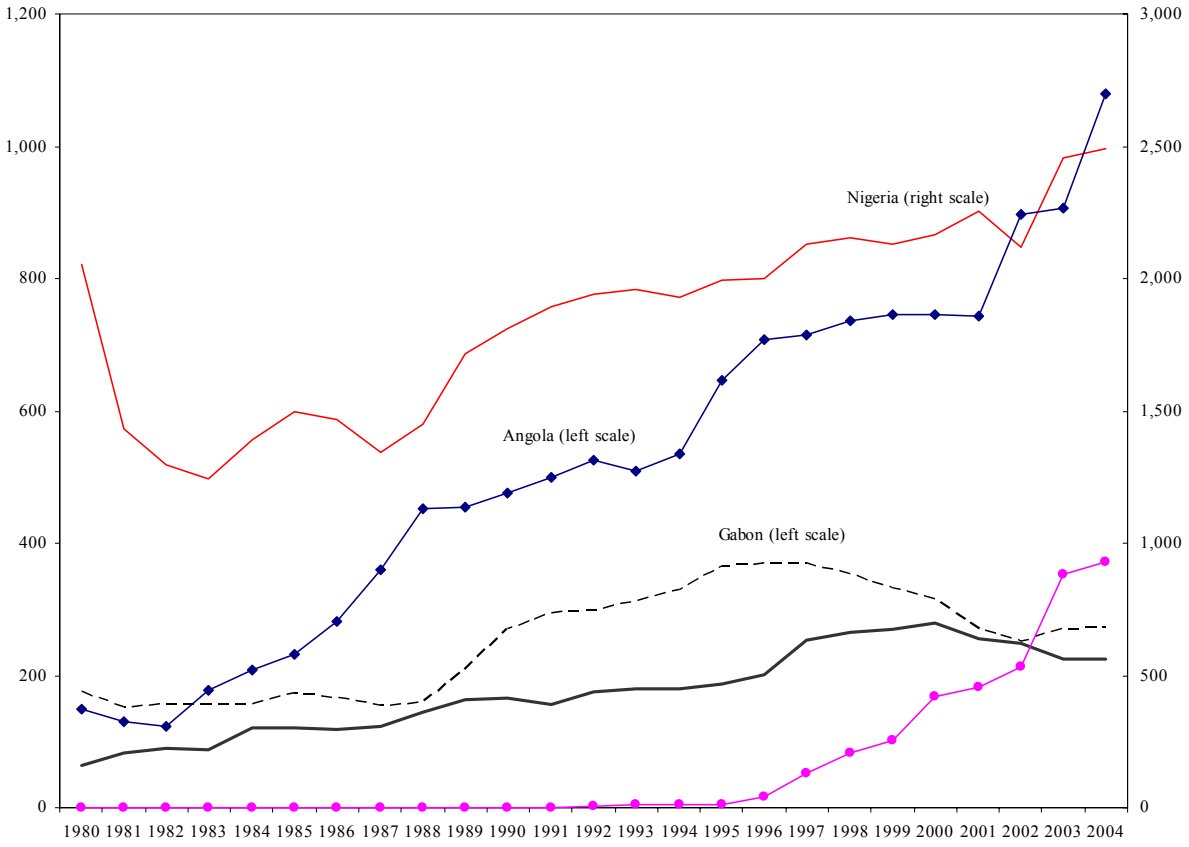
As mentioned above, Congo is the fifth largest petroleum producer in sub-Saharan Africa (after Nigeria, Angola, Gabon, and Equatorial Guinea: Figure 5).[5] Oil production commenced in 1957 from the onshore Pointe Indienne field, which reached a peak output of about 2,500 barrels per day in the mid-1960s. During the 1980s and 1990s Congo's crude production quadrupled, from 65,000 barrels per day in 1980 to an average of 280,000 barrels per day in 2000. Since then production has been falling, largely due to a decline in production of mature fields, and delays in bringing several new fields online. Crude oil production fell from an average of 275,000 barrels per day in 2001 to 225,000 barrels per day in 2004. However, oil production is expected to rebound over the short- and medium-term as new fields come online and offset declining output from more mature fields.

At end-2003, proven oil reserves in Congo were estimated at 1.5 billion barrels, implying a life reserve index of around 18 years at the 2004 production rate of nearly 85 million barrels per annum. Based on geological data, undiscovered reserves are estimated at 5.8 billion barrels on a risk-weighted basis. Total oil reserves are thus currently estimated at 7.3 billion barrels (proven plus unproven sources).

Congo's petroleum resources were developed by international companies, which still continue to dominate oil production. With the creation in 1998 of the national oil company, SNPC, the government aimed at developing a homegrown operational, technical, and marketing expertise. SNPC has a share of about 10 percent in the country's oil production through equity participation in various fields, although it does not operate any field at present. The industry structure is more diversified at the exploration and development stages, where a number of international companies have been active in recent years.

[5] Aggregate data comprise production of crude oil and natural gas liquids (NGLs).

Figure 5. West African Oil Production, 1980–2004
(In thousands of barrels per day)



Source: IMF staff estimate.

The oil sector's share in fiscal revenues and export receipts has been increasing more-or-less steadily over time. The oil sector currently accounts for about 70 percent of total government revenues and over 80 percent of merchandise export receipts (Figure 6). As Table 2 shows, among the main African oil producers only Equatorial Guinea has a higher share of oil in GDP (at constant prices), but the Congo is less dependent on the oil sector for its export receipts and, with the exception of Gabon, for its fiscal revenues.

Table 2. Oil-Producing African Countries—Key Oil Sector Parameters, 2003

Country	Oil sector output (percent of GDP at constant prices)	Oil fiscal revenue (percent of of total government revenues)	Oil export revenues (percent of of total export receipts) [1/]
Angola	32.3	75.1	91.3
Equatorial Guinea	71.8	84.4	95.8
Gabon	28.2	54.4	84.1
Nigeria	30.9	75.4	97.3
Congo, Republic of	33.7	68.7	81.9

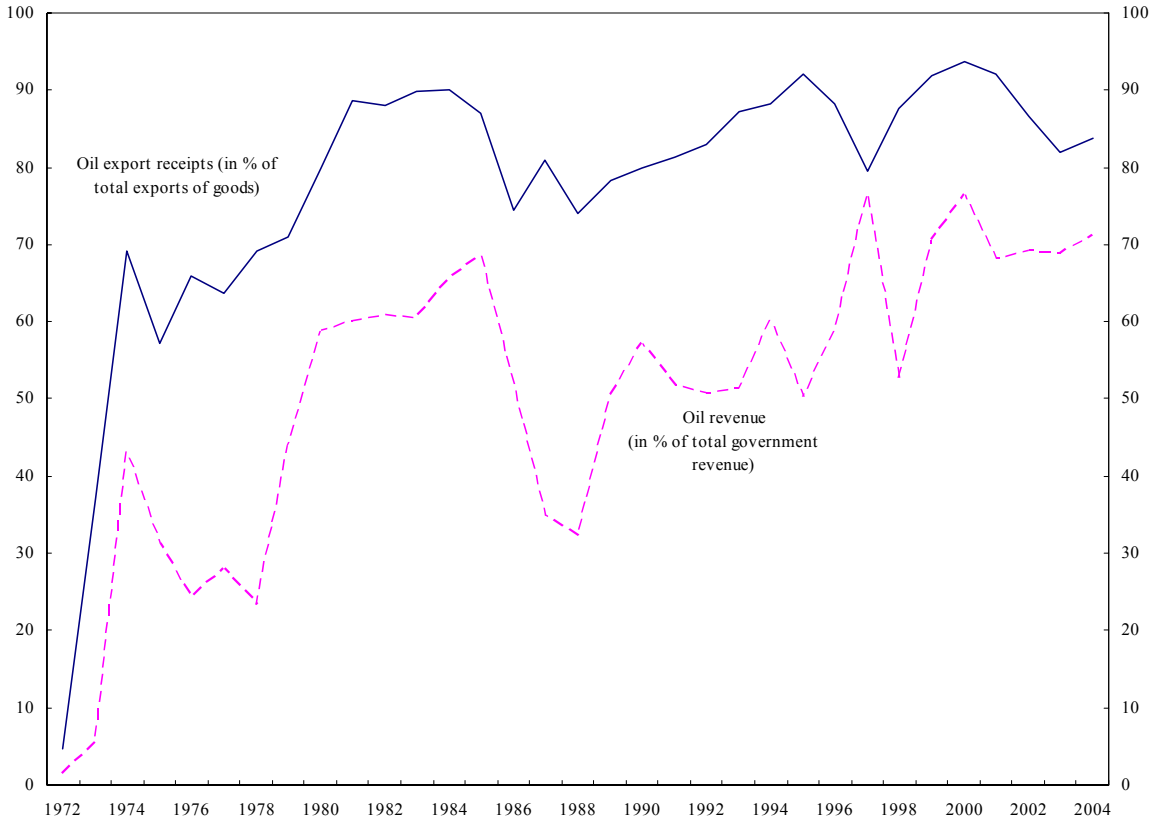
Source: IMF staff estimates.

1/ Revenues from exports of merchandise goods.

However, available information indicate that Congo has had limited success in utilizing its oil resources to significantly advance the welfare of its people. Even though Congo's human development index is higher than the average for sub-Saharan Africa and for (oil- and non-oil producing) PRGF-eligible countries, it has been falling steadily since 1985.[6] Moreover, poverty remains widespread: according to the United Nations Development Program, 70 percent of the population live below the poverty line, unemployment and underemployment affect 50 percent of the active population, and only 30 percent of the population has access to adequate medical care. Over the past decade Congo has also fallen significantly behind other developing countries, including oil-producing PRGF-eligible countries, in per capita GDP growth performance (Figure 7). The question that arises, and that this paper seeks to address, is how has the country's dependence on oil affected economic growth, both directly and indirectly.

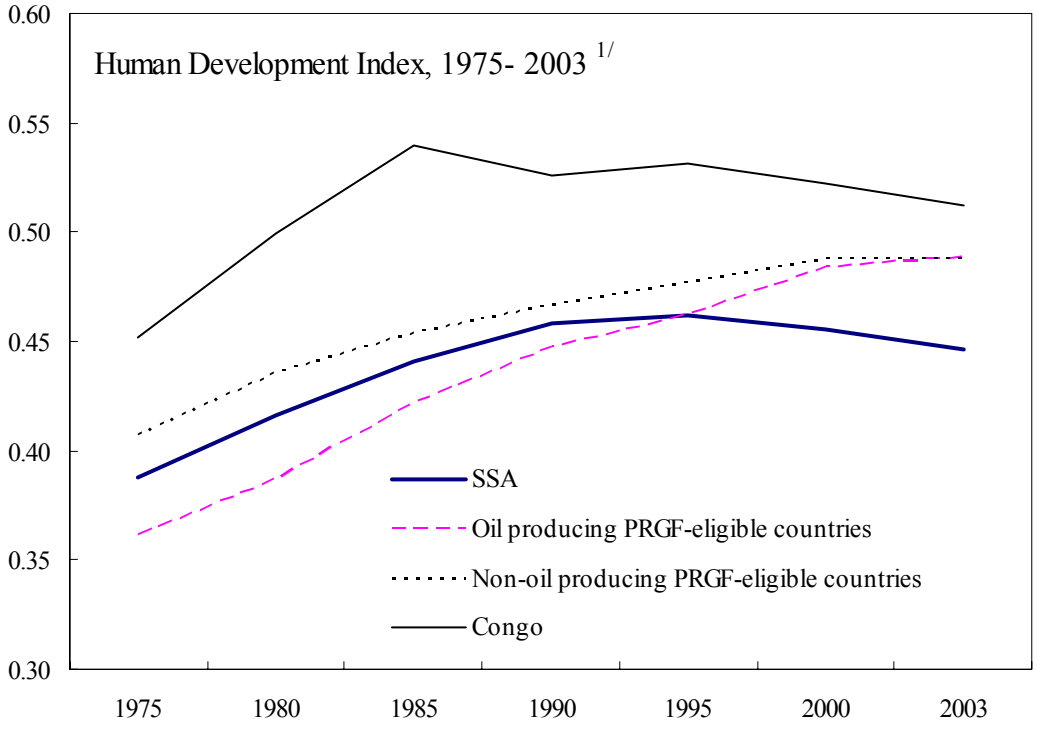
[6] PRGF-eligible countries are low-income countries that are classified as eligible for the IMF's Poverty Reduction and Growth Facility (PRGF).

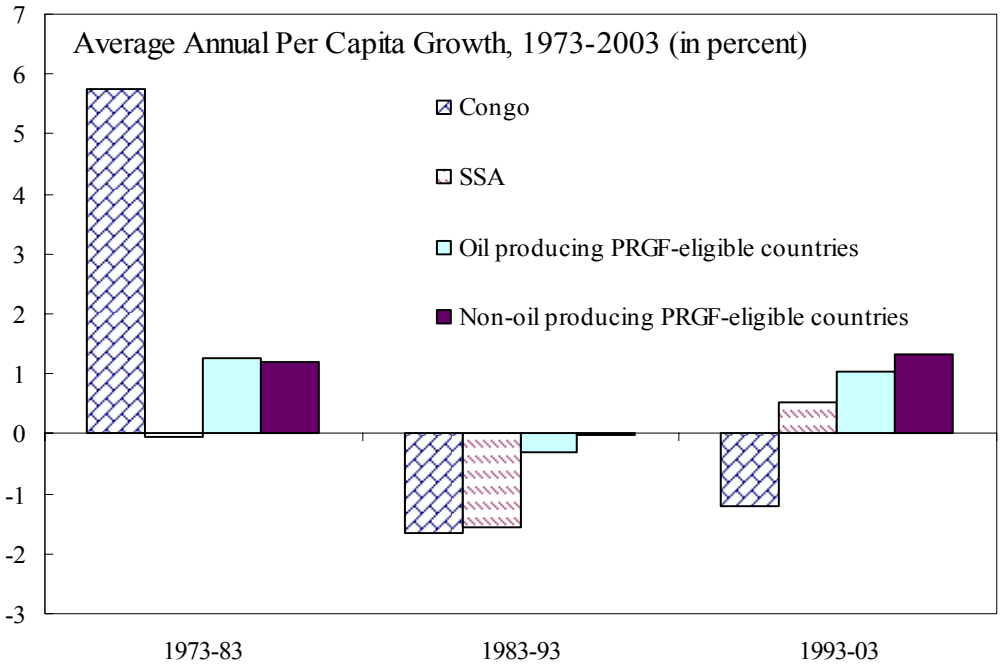
Figure 6. Republic of Congo: Oill Export Receipts and Fiscal Oil Revenues, 1972-2004
(In percent)



Source: IMF staff estimates.

Figure 7. Republic of Congo: Human Development Index and Growth





Sources: IMF, *World Economic Outlook*; and United Nations Development Program.

1/ Includes only countries for which data are available for all periods.

V. Natural Resources and Growth

The literature suggests three main channels through which natural resource abundance can affect growth. One channel highlights political economy effects, whereby natural resources generate rents which in turn leads to rapacious rent-seeking (the "voracity" effect, as in Tornell and Lane, 1999) and to increased corruption (Mauro, 1995: Leite and Weidmann, 1999) with adverse effects on long-term growth. Second, heavy dependence on natural resources exposes countries to volatility, particularly with regard to commodity prices, which could have an adverse effect on growth. Finally, there is the well-known "Dutch disease" problem, whereby exploitation of natural resources leads to real exchange rate appreciation, and this in turn results in a contraction of the tradable sector. As argued by Sala-i-Martin and Subramanian (2003), this outcome, combined with the proposition that the tradable sectors generate higher growth owing to learning-by-doing and other positive externalities, leads to the conclusion that natural resource abundance exerts a drag on growth over the long run. At the same time, it could be argued that the Dutch disease is not a 'disease' per se, but simply reflects the healthy functioning of the price mechanism (including on factor prices) in a general equilibrium framework. Moreover, in many oil-producing countries nonprice factors (including lack of basic infrastructure, and government corruption and red tape) often pose more formidable obstacles to growth in the non-oil sector than price-related factors, including developments in the real effective exchange rate.

In general, empirical work provides support for the hypothesis that heavy dependence on natural resources tends to have a negative effect on growth. Sachs and Warner (1995) find, on the basis of cross-section growth regressions, that the curse of natural resource dependence is substantial, with countries dependent on natural resources growing, on average, about 1 percent a year slower during the period 1970-89. More recent empirical studies have suggested that natural resource abundance negatively affects economic growth mainly through its adverse effect on institutions.[7]

Collier and Hoffler (2002) brought a new dimension to the existing literature by arguing that natural resources considerably increase the chances of civil conflict.[8] They suggest that exports of natural resources can increase the risk of civil conflict in four ways: by providing a source of finance for rebel groups, worsening corruption in government, increasing the incentive for secession, and increasing exposure to shocks. According to their estimates using cross-section data, the effect of natural resources on conflict is strong and non-linear. A country that has no natural resources faces a probability of civil conflict of 0.5 percent, whereas a country with a 26 percent share of natural resources in GDP faces a probability of 23 percent. Collier and Hoffler (2002) rationalize this by noting that, in countries heavily dependent on exports of natural resources, income from these natural resources becomes a very significant source of revenue for the government. This revenue can be used to strengthen the state militarily, and this in turn serves as a disincentive for armed conflict by

[7] See, for example, Isham and others (2003), Sala-i-Martin and Subramanian (2003), and Yartley (2004).

[8] Gudmundsson (2004) provides an excellent survey of the literature on the causes and consequences of civil conflicts.

rebel groups. This paper was followed by a number of other interesting empirical studies on this subject.[9] Yartey (2004), using cross-section data, finds that the inclusion of institutional variables in the Collier and Hoeffler model makes the share of primary commodity exports in GDP, and its square, statistically significant at the 10 percent level, providing support for a quadratic relationship between primary commodity exports and the risk of civil war.

Empirical research on the impact of civil war on economic growth has yielded mixed results. Many of the earlier empirical studies found no statistically significant relationship between economic growth and the incidence of civil war.[10] More recent studies have tended to find a significantly negative growth effect of civil war.[11]

This paper applies a time-series analysis to examine how developments in the oil sector affect growth in the non-oil sector, both directly and indirectly through the real effective exchange rate and political economy effects.[12] The data used for the analysis were taken from the IMF *World Economic Outlook* and *International Financial Statistics* databases and the World Bank's *World Development Indicators* database. The capital stock series was derived by assuming a capital stock-to-output ratio of 1.5 in 1960 and then applying the perpetual inventory method with an assumed constant rate of depreciation of 5 percent a year. An index of real per capita GDP relative to the Congo's trading partners as an explanatory variable in estimating the real effective exchange rate was calculated using per capita GDP data (in constant 2000 U.S. dollars) for Congo and her trading partners from the *World Development Indicators* database and applying the same country weights as used in the IMF Information Notice System calculation of the real effective exchange rate for Congo. Data on the value of Congo's oil exports as a share of total exports was spliced from series obtained from the *World Economic Outlook* and past issues of the IMF Recent Economic Developments: Republic of Congo. Table 3 presents descriptive statistics for the main variables used in the empirical analysis; Table 4 presents the correlation matrix of these variables.

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[9] See, for example, Collier (1999), Collier and others (2003), Easterly and Levine (1997), Elbadawi and Sambanis (2000), and Sambanis (2003).

[10] See, for example, Easterly et al (1993), Barro and Lee (1994) and Caselli et al (1996).

[11] See, for example, Sachs and Warner (1997), Easterly and Levine (1997), Sala-i-Martin (1997), Murdoch and Sandler (2002), Artadi and Sala-i-Martin (2003), and Gyimah-Brempong and Corley (2005).

[12] Sala-i-Martin and Subramanian (2003) examine the impact of the oil sector on growth and institutions in Nigeria; the approach they take is to add a country dummy variable for Nigeria in panel data estimations.

Table 3. Descriptive Statistics of Main Variables Used in Empirical Analysis

Variable	No. of observations	Mean	Median	Maximum	Minimum	Standard Deviation
$BudY_t$	35	0.028	0.011	0.179	-0.062	0.061
$DOILX_t$	35	0.019	0.014	0.126	-0.075	0.051
$DOILY_t$	40	0.007	0.004	0.140	-0.068	0.035
$GEXP_t$	35	0.342	0.350	0.494	0.213	0.068
$GPRIEXP_t$	35	0.237	0.233	0.330	0.168	0.042
Kg_t	40	0.021	0.020	0.132	-0.054	0.052
$K^{NO}g_t$	40	0.011	0.027	0.174	-0.171	0.076
$LOILPRICER_t$	39	2.933	2.911	3.753	2.000	0.515
$LREXR_t$	40	4.579	4.602	4.850	4.214	0.157
$LRPCGDP_t$	33	0.314	0.335	0.707	-0.016	0.212
$NFAMGS_t$	35	-0.010	0.006	0.256	-0.228	0.114
$OPEN_t$	35	0.596	0.551	1.031	0.195	0.275
$RERg_t$	40	-0.009	0.006	0.114	-0.319	0.070
$TOTg_t$	35	0.002	-0.051	0.798	-0.456	0.240
Yg_t	40	0.014	0.009	0.184	-0.120	0.059
$Y^{NO}g_t$	40	0.005	0.001	0.178	-0.164	0.082

Sources: *World Economic Outlook, International Financial Statistics, World Development Indicators, Recent Economic Developments.*

Table 4. Correlation Matrix of Main Variables Used in Empirical Analysis

Variable	$BudY_t$	$DOILX_t$	$DOILY_t$	$GEXP_t$	$GPRIEXP_t$	Kg_t	$K^{NO}g_t$	$LOILPRICER_t$	$LREXR_t$	$LRPCGDP_t$	$NFAMGS_t$	$OPEN_t$	$RERg_t$	$TOTg_t$	Yg_t	$Y^{NO}g_t$
$BudY_t$	1.000															
$DOILX_t$	-0.003	1.000														
$DOILY_t$	-0.181	0.078	1.000													
$GEXP_t$	0.179	-0.136	-0.229	1.000												
$GPRIEXP_t$	-0.532	-0.194	-0.218	0.534	1.000											
Kg_t	0.319	0.085	-0.112	0.100	-0.002	1.000										
$K^{NO}g_t$	0.327	0.009	-0.745	0.171	0.122	0.748	1.000									
$LOILPRICER_t$	0.558	0.071	-0.530	0.377	0.072	0.315	0.552	1.000								
$LREXR_t$	-0.318	-0.208	0.191	-0.161	0.298	0.277	0.065	0.018	1.000							
$LRPCGDP_t$	0.215	-0.019	0.084	0.338	0.087	0.549	0.299	0.320	0.566	1.000						
$NFAMGS_t$	0.318	0.334	-0.218	-0.243	-0.319	0.391	0.409	0.061	-0.170	-0.151	1.000					
$OPEN_t$	0.197	0.011	-0.178	0.165	-0.185	-0.547	-0.253	-0.060	-0.900	-0.686	0.057	1.000				
$RERg_t$	0.076	-0.594	0.044	0.062	0.034	-0.156	-0.138	-0.110	0.266	0.009	-0.148	-0.025	1.000			
$TOTg_t$	0.174	0.552	-0.105	-0.160	-0.144	0.007	0.073	0.327	-0.112	-0.173	0.403	0.027	-0.299	1.000		
Yg_t	0.251	0.214	-0.122	0.071	-0.127	0.574	0.479	0.404	0.246	0.322	0.438	-0.312	0.058	0.194	1.000	
$Y^{NO}g_t$	0.286	0.115	-0.670	0.143	0.016	0.493	0.798	0.593	0.079	0.184	0.451	-0.138	0.010	0.199	0.813	1.000

Sources: *World Economic Outlook, International Financial Statstics, World Development Indicators, Recent Economic Developments.*

VI. Empirical Analysis of the Determinants of Economic Growth

1. The starting point for our empirical analysis of the determinants of growth in Congo is a standard constant-returns-to-scale Cobb-Douglas production function of the form

$$Y_t = AK_t^{\alpha}L_t^{(1-\alpha)} \quad (1)$$

where Y_t is output (GDP at constant prices), K_t is physical capital, L_t is labor, and A is the total factor productivity. Taking natural logarithms, and expressing (1) in units per worker, gives

$$y_t = \alpha_0 + \alpha k_t \quad (2)$$

where y_t is (the natural log of) output per worker, k_t is (the natural log of) physical capital per worker, and α_0 is log(A).

Unit root test results (augmented Dickey-Fuller and Phillips-Perron) on y_t and k_t could not reject the hypothesis that these variables are non-stationary at any of the standard significance levels.[13] However, the Johansen trace and maximum eigenvalue tests, reported in Table 5, do not provide conclusive evidence in favor of a unique co-integrating relationship between these two variables, either for overall GDP or for non-oil GDP. This may be due to the low power of these tests.

[13] Augmented Dickey-Fuller and Phillips-Perron unit root test results on the empirical variables used in this paper are not reported here for the sake of brevity.

Table 5. Johansen Cointegration Test Summary for Growth Analysis

Sample: 1965-2004
Series: (Logs of) GDP per worker at constant 1990 prices and capital stock per worker
Lag interval: 1 to 1

Selected (at 5 percent significance level) number of cointegrating relations by model [1/]

Data Trend:	None	None	Linear	Linear	Quadratic
Test Type:	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
Trace Test	1	1	2	0	2
Maximum Eigenvalue Test	1	0	2	0	0

1/ Critical values based on MacKinnon-Haug-Michelis (1999)

Sample: 1965-2004
Series: (Logs of) Non-oil GDP per worker at constant 1990 prices and non-oil capital stock per worker
Lag interval: 1 to 1

Selected (at 5 percent significance level) number of cointegrating relations by model [1/]

Data Trend:	None	None	Linear	Linear	Quadratic
Test Type:	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
Trace Test	1	0	2	0	0
Maximum Eigenvalue Test	1	0	0	0	0

1/ Critical values based on MacKinnon-Haug-Michelis (1999)

Since only two non-stationary variables are involved, the Engle-Granger approach is used to estimate a cointegrating relationship. Applying this two-step approach gives an estimate of α of 0.83 for total GDP, and of 0.79 for non-oil GDP (Table 6).[14] This implies a share of income from physical capital in total GDP of around 80 percent; this compares with an estimate by Senhadji (2000) of an average share of physical capital in total output of 43 percent for sub-Saharan Africa, and of 55 percent for the world as a whole.[15]

Table 6. OLS Estimation of Cointegrating Vectors

Variable	Equation 3 Dependent Variable: (Log of) Real GDP per worker	Equation 4 Dependent Variable: (Log of) Real Non-oil GDP per worker
Constant	0.022	0.227
(Log of) Capital stock per worker	0.828	
(Log of) Non-oil capital stock per worker		0.794
Estimation period	1965-2004	1965-2004
Adjusted R-squared	0.888	0.862
Unit root tests on residuals: 1/		
Augmented Dickey-Fuller t-statistic:	-3.281	-3.53
	-0.023	-0.010
Phillips-Perron Adjusted t-statistic:	-2.709	-2.990
	-0.082	-0.040

1/ MacKinnon (1996) one-sided p-values in brackets.

The unit root test results presented in Table 6 indicate that the residuals from the estimated long-run equations are stationary, while the coefficients on the residuals from these equations

[14] The long-run co-integrating relationships were also estimated with a trend term to allow for autonomous technological progress, but the estimated coefficients on the trend terms were close to zero, and using the residuals from these equations made very little difference to the growth results presented in this paper.

[15] Senhadji's empirical results for 66 countries show a wide variation in estimates of α for African countries, varying from 0.91 in the case of Ghana to 0.13 in the case of Ethiopia.

are negative and statistically significant in the estimated growth equations reported below, providing validity to the application of the Engle-Granger approach.

Moving to the second stage, the following neoclassical growth equation for total real GDP is estimated using standard explanatory variables that are commonly used in most cross-country growth regressions:

$$Yg_t = \beta_0 + \beta_1 Kg_{t-1} + \beta_2 ECT^T_{t-1} + \beta_3 BudY_t + \beta_4 BudY_{t-1} + \beta_5 BudY_{t-3} + \beta_6 TOTg_t + \beta_7 TOTg_{t-1} + \beta_8 TOTg_{t-2} + \beta_9 RERg_{t-1} + \beta_{10} RERg_{t-2} + \beta_{11} PI_{t-1} + \upsilon_t \quad (5)$$

where

Yg_t is the first difference of the natural log of real GDP per worker;

Kg_t is the first difference of the natural log of physical capital per worker;

ECT^T_{t-1} is the error correction term (the estimated residuals from Equation 3, lagged one period);

$BudY_t$ is the central government basic primary fiscal balance as a ratio to GDP;

$TOTg_t$ is the first difference of the natural log of the terms of trade;

$RERg_t$ is the first difference of the natural log of the real effective exchange rate;

PI_t is a dummy taking the value of 1 in years where there is a coup or armed civil conflict; and

υ_t is a random disturbance term.

Unit root tests indicate that these explanatory variables are stationary.

The results of estimating Equation (5) using two-stage least squares are presented in Equation (6) in Table 7. Among the explanatory variables only the terms of trade and the error correction term are taken to be exogenous; the terms of trade is taken to be exogenous since Congo is a small economy with little influence on world market prices. The instruments used are the dependent variable and the endogenous explanatory variables, all lagged four periods to take account of serial correlation. Since the political instability variable turned out to be statistically insignificant, although of the expected negative sign, the equation was re-estimated excluding this as an explanatory variable. Equation (7) in Table 7 present the results of this re-estimation. The estimated equations pass the standard diagnostic tests.[16]

[16] The Jarque-Bera test for normality of residuals, the Ramsey Reset test for functional misspecification, the Breusch-Godfrey serial correlation test, and the White heteroscedasticity test.

Table 7. Determinants of Real GDP Growth—Two Stage Least Squares Estimates

Dependent variable: Growth rate of real GDP per worker

Variable	Equation 6		Equation 7	
	Co-efficient	t-statistic [1/ 2/]	Co-efficient	t-statistic [1/ 2/]
(Capital stock per worker) $_{t-1}$ [3/]	0.289	2.281 **	0.291	2.492 **
Basic primary balance [4/]	-0.242	-2.743 **	-0.236	-3.028 ***
(Basic primary balance) $_{t-1}$ [4/]	0.201	3.505 ***	0.204	3.462 ***
(Basic primary balance) $_{t-3}$ [4/]	0.513	5.709 ***	0.510	6.073 ***
Terms of trade [3/]	0.091	4.317 ***	0.089	4.815 ***
(Terms of trade) $_{t-1}$ [3/]	0.097	4.770 ***	0.100	4.617 ***
(Terms of trade) $_{t-2}$ [3/]	0.067	3.064 ***	0.069	3.116 ***
(Real effective exchange rate) $_{t-1}$ [3/]	-0.151	-2.153 **	-0.155	-2.138 **
(Real effective exchange rate) $_{t-2}$ [3/]	-0.338	-4.583 ***	-0.331	-4.787 ***
(Political instability) $_{t-1}$	-0.004	-0.380		
Error correction term from equation 3	-0.435	-4.334 ***	-0.433	-4.412 ***
Constant	-0.012	-1.875 *	-0.013	-2.222 **
Estimation period	1970-2004		1970-2004	
Adjusted R-squared	0.855		0.865	
Jarque-Bera Normality test (p-value)			0.891	
Ramsey RESET test (p-value)			0.194	
Breusch-Godfrey Serial Correlation test (Lag 1, p-value)			0.675	

(***), (**) and (*) denote statistical significance at the 1, 5 and 10 percent levels, respectively.
1/ Adjusted to correct for fourth-order serial correlation.
2/ Calculated applying Newey-West heteroscedasticity-consistent standard errors.
3/ In first difference of natural log.
4/ In ratio to GDP.

The results indicate that:

- The error correction term from the estimated long-run equation is statistically significant, and with the right sign, providing validity to the application of the Engle-Granger approach;

- Capital stock growth has a significant positive impact on growth;

- An improvement in the basic primary fiscal balance has a Keynesian effect in the short-run, being associated with lower real GDP growth contemporaneously, but is conducive to higher growth over the medium-term. This could be because, in the short run, fiscal consolidation has the standard Keynesian effects on employment and growth, but over time it may promote investment and growth by lowering the cost of funds for private investment and by enhancing the credibility of the government for effectively managing the macroeconomy (and more specifically the country's public finances). The overall impact on growth of an improvement in the government's fiscal position is positive.

- Improvements in the terms of trade have a positive impact on growth, while appreciation of the real effective exchange rate has a detrimental effect on growth, with a lag. Both effects are statistically significant.

Political instability and the real effective exchange rate may have very different effects on the oil and non-oil sectors of the economy. The analysis, therefore, goes on to estimate similar growth equations for the non-oil sector, to allow for this possibility, and to examine possible links between the oil and non-oil sectors. More specifically, the following equation is estimated:

$$Y^{NO}g_t = \gamma_0 + \gamma_1 K^{NO}g_t + \gamma_2 K^{NO}g_{t-2} + \gamma_3 ECT^{NO}_{t-1} + \gamma_4 BudY_t + \gamma_5 BudY_{t-1} + \gamma_6 BudY_{t-3} + \gamma_7 TOTg_t + \gamma_8 RERg_{t-2} + \gamma_9 PI_{t-1} + \mu_t \quad (8)$$

where

$Y^{NO}g_t$ is the first difference of the natural log of real GDP per worker in the non-oil sector;

$K^{NO}g_t$ is the first difference of the natural log of physical capital per worker in the non-oil sector;

ECT^{NO}_{t-1} is the error correction term (the estimated residuals from Equation 4, lagged one period);

μ_t is a random disturbance term;

and the other variables are as defined above.

Separate data are not available for the labor force disaggregated by oil and non-oil sectors. This is, however, not likely to make much difference to the results, since the total labor force is roughly equal to the non-oil labor force, given that the oil sector is not labor-intensive. As

before, all of the explanatory variables except for the terms of trade and the error correction term are taken to be endogenous. The instruments used for the two-stage least squares estimation are the dependent variable and the endogenous explanatory variables, all lagged four periods to take account of serial correlation.

The results obtained, and presented in Equation (9) in Table 8, are very similar to those for the overall economy. A key difference, however, is that the terms of trade is not statistically significant, while political instability has an adverse and highly statistically significant impact. Given the statistical insignificance of the terms of trade, Equation (10) presents the results of re-estimating the equation excluding this variable. All the coefficients are statistically significant and of the expected sign. In particular, the coefficient on the error correction term is statistically significant and negative. The results also indicate that real effective exchange rate appreciation has a statistically significant negative impact on non-oil real GDP growth, with a lag. The estimated equations pass all of the standard diagnostic tests mentioned above.

Table 8. Determinants of Non-Oil Real GDP Growth—Two Stage Least Squares Estimates

Dependent variable: Growth rate of non-oil real GDP per worker

Variable	Equation 9		Equation 10		Equation 11		Equation 12	
	Co-efficient	t-statistic [1/2/]	Co-efficient	t-statistic [1/2/]	Co-efficient	t-statistic [1/2/]	Co-efficient	t-statistic [1/2/]
Non-oil capital stock per worker [3/]	1.067	11.647 ***	1.068	12.202 ***	1.084	11.941 ***	1.073	12.389 ***
(Non-oil capital stock per worker) $_{t-2}$ [3/]	-0.300	-2.757 **	-0.300	-2.835 **	-0.312	-2.714 **	-0.309	-2.938 ***
Basic primary balance [4/]	-0.278	-2.081 **	-0.266	-2.232 **	-0.262	-2.760 **	-0.247	-2.099 *
(Basic primary balance) $_{t-1}$ [4/]	0.366	2.919 **	0.360	3.018 ***	0.370	2.487 **	0.347	2.732 **
(Basic primary balance) $_{t-3}$ [4/]	0.497	5.778 ***	0.498	6.727 ***	0.497	5.143 ***	0.473	4.151 ***
Terms of trade [3/]	0.005	0.240						
(Real effective exchange rate) $_{t-2}$ [3/]	-0.277	-5.197 ***	-0.270	-5.472 ***	-0.271	-5.137 ***	-0.271	-4.809 ***
(Political instability) $_{t-1}$	-0.048	-5.317 ***	-0.050	-5.414 ***	-0.055	-4.164 ***	-0.050	-5.556 ***
(Change in share of oil sector in real GDP) $_{t-1}$					0.125	0.405		
(Change in share of value of oil exports in percent of GDP) $_{t-1}$							-0.068	-0.844
Error correction term from equation 4	-0.562	-4.511 ***	-0.574	-4.494 ***	-0.546	-4.417 ***	-0.579	-4.288 ***
Constant	-0.010	-1.538	-0.010	-1.742	-0.010	-1.273		-1.089
Estimation period	1970-2004		1970-2004		1970-2004		1970-2004	
Adjusted R-squared	0.880		0.888		0.881		0.882	
Jarque-Bera Normality test (p-value)			0.111					
Chow Breakpont Test (1990, p-value)			0.330					
Ramsey RESET test (p-value)			0.609					
Breusch-Godfrey Serial Correlation test (Lag 1, p-value)			0.376					

(***), (**) and (*) denote statistical significance at the 1, 5 and 10 percent levels, respectively.
1/ Adjusted to correct for fourth-order serial correlation.
2/ Calculated applying Newey-West heteroscedasticity-consistent standard errors.
3/ In first difference of natural log.
4/ In ratio to GDP.

To empirically test for direct linkages between the oil and non-oil sectors of the economy, Equation (10) is re-estimated, but including the lagged values of (the change in) the share of the oil sector in real GDP, and (the change in) the value of oil exports in GDP, respectively as additional explanatory variables in Equations (11) and (12).[17] The growth results do not alter significantly as a result of the inclusion of these additional variables, and neither of these variables are statistically significant. Moreover, the Granger causality test results reported in Table 9 provide no evidence that growth in the oil sector Granger-causes non-oil growth.

Table 9. Granger-Causality Tests

	Lag 1		Lag 2		Lag 3	
Null hypothesis	F stat.	P-value	F stat.	P-value	F stat.	P-value
Oil sector growth does not Granger-cause non-oil sector growth	0.172	0.681	0.622	0.543	0.795	0.506
Non-oil growth sector does not Granger-cause oil sector growth	0.645	0.427	0.461	0.634	0.409	0.748

The empirical analysis of non-oil real GDP growth does not provide empirical evidence for the hypothesis that the oil sector has had any direct spillover effects, either positive or negative. However, it may have had indirect negative effects on non-oil growth through a number of channels.

- First, the growth results indicate that political instability has had a significant negative effect on growth of the non-oil sector. In Congo, the presence of oil could have fueled civil conflict and political unrest in at least two ways, namely by being associated with weakening of institutions and rising corruption in government, and by providing a source of finance to rebel groups. It may also have fuelled "grievance" by increasing the volatility of the economy through greater exposure to shocks in the world oil market. The first channel seems particularly pertinent to Congo.

[17] The results of augmented Dickey-Fuller and Phillips-Perron unit root tests indicate that both of these variables are stationary.

- Second, development of the oil sector may have had an indirect effect on growth through the real effective exchange rate, that is, the so-called "Dutch disease" avenue. The growth results indicate that appreciation of the real effective exchange rate negatively affects growth of both the overall economy and of the non-oil sector.

This paper now goes on to examine if there exists a statistically significant relationship between oil and the real effective exchange rate.

VII. Real Effective Exchange Rate Determinants

As shown in Figure 4, a striking feature of the real effective exchange rate is that it has exhibited a trend depreciation over the past four decades—contrary to what one would expect if the Dutch disease phenomenon were at play. This could be because oil revenues have been spent mostly on imports, including on purchases of arms by both rebel groups and the government, rather than on non-tradables. A significant share of oil revenues may also have been deposited in overseas bank accounts, or invested in foreign assets, instead of being repatriated to the Congo and the funds spent or invested domestically.

The importance of the real effective exchange rate in explaining growth, however, calls for a more detailed and sophisticated analysis of its relationship with oil. To empirically investigate the impact that the oil sector may have had on the real effective exchange rate, a vector error correction model (VECM) is estimated, and is based on the real effective exchange rate model presented and estimated in MacDonald and Ricci (2003). Estimation of the VECM employed the following variables:

$LREXR_t$: Natural logarithm of the real effective exchange rate;

$LOILPRICER_t$: Natural logarithm of the world oil price, in U.S. dollars per barrel, deflated by the export price deflator for the Group of Seven (G-7) industrialized countries;

$LRPCGDP_t$: Natural logarithm of real GDP per capita relative to the Congo's trading partners;

$NFAMGS_t$: Net foreign assets of the banking system as a ratio to exports of goods and services;

$OPEN_t$: Openness measure (ratio to GDP of the sum of exports and imports of goods);

Various fiscal measures (basic primary fiscal balance, total government expenditures, total government domestically-financed primary expenditures, all as ratios to GDP — $BudY_t$, $GEXP_t$, and $GPRIEXP_t$ respectively); and

Dummy variables for the impact of the January 1994 CFA devaluation on the level (permanent) and growth rate (temporary) of the real effective exchange rate.

An increase in the world price of commodities exported by a country would tend to appreciate the real effective exchange rate, for example by raising domestic demand and putting upward pressure on the price of nontradables. In principle, these effects should be captured more comprehensively by the terms of trade. In practice, however, few studies have found a significant relationship between the real effective exchange rate and the terms of trade, while a number of empirical studies have found commodity prices to be strongly cointegrated with the real effective exchange rate of commodity exporters.[18] MacDonald and Ricci (2003) argue that this may be explained by the relative accuracy of the measurement of commodity prices, as opposed to the arbitrariness involved in the construction of country-specific export and import price deflators. For Congo, the trace and maximum eigenvalue tests for cointegration reported in Table 10 provide much stronger evidence of a cointegrating relationship between the (logs of) the real effective exchange and the world price of oil than between the (logs of) the real effective exchange rate and the terms of trade.

An increase in per capita real GDP of a country relative to its trading partners will have an income (Balassa-Samuelson) effect. In particular, stronger productivity growth in the tradable sector (relative to the country's trading partners) is likely to give rise to demands for higher wages in the tradable sector; if wages are equalized across sectors, this would put upward pressure on the price of nontradables, leading to an appreciation of the real effective exchange rate.

An increase in net foreign assets is likely to be associated with a more appreciated exchange rate, as discussed in Lane and Milesi-Ferretti (2000). In part, this is because higher net foreign assets may induce increased spending on domestic goods, thus raising the price of nontradables and appreciating the real effective exchange rate. Moreover, as noted by MacDonald and Ricci (2003), a country that increases its level of net foreign assets can afford to finance a larger current account deficit, and can therefore sustain a loss in competitiveness associated with a more appreciated real effective exchange rate.

To the extent that trade restrictions raise the domestic price of tradable goods, putting upward pressure on the overall price level and hence on the real effective exchange rate, a more open trade regime is likely to be associated with a more depreciated real effective exchange rate. The empirical analysis in this paper uses as a proxy for openness the ratio to GDP of the sum of exports and imports of merchandise goods.

[18] See, for example, Chen and Rogoff (2002), MacDonald (2002), Cashin, Cespedes, and Sahay (2002), and Prati, Sahay, and Tressel (2003).

Table 10. Johansen Cointegration Test Summary for Real Effective Exchange Rate Analysis

Sample: 1972-2004
Series: (Logs of) Real effective exchange rate, Terms of trade index
Exogenous variables: Permanent and Temporary dummy variables for 1994 devaluation, Δ(Log of) per capita GDP relative to trading partners (constant 2000 US$), Net foreign assets of the banking system as ratio to exports of goods and services, Openness measure
Lag interval: 1 to 1

Selected (at 5 percent significance level) number of cointegrating relations by model [1/]

Data Trend:	None	None	Linear	Linear	Quadratic
Test Type:	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
Trace Test	1	1	0	0	0
Maximum Eigenvalue Test	1	1	0	0	0

1/ Critical values based on MacKinnon-Haug-Michelis (1999)

Sample: 1972-2004
Series: (Logs of) Real Effective Exchange Rate, Oil price (U.S.$/barrel) deflated by G7 export price deflator
Exogenous variables: Permanent and Temporary Dummy Variables for 1994 devaluation, Δ(Log of) per capita GDP relative to trading partners (constant 2000 US$), Net foreign assets of the banking system as ratio to exports of goods and services, Openness measure
Lag interval: 1 to 1

Selected (at 5 percent significance level) number of cointegrating relations by model [1/]

Data Trend:	None	None	Linear	Linear	Quadratic
Test Type:	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
Trace Test	1	1	1	1	1
Maximum Eigenvalue Test	1	1	1	1	1

1/ Critical values based on MacKinnon-Haug-Michelis (1999)

The empirical analysis employs three variables to capture the effect of fiscal policy: the basic primary balance, total government expenditures, and total government domestically-financed primary expenditures, all as ratios to GDP.

Augmented Dickey-Fuller and Phillips-Perron unit root tests indicate that the (logs of) the real effective exchange, the oil price deflated by the G7 export price deflator, and real GDP per capita relative to trading partners all have a unit root (i.e. are non-stationary), while the rest of the variables are stationary (although the results on the openness measure are borderline).[19] The unit root tests provide the basis for the specification of the VECM models that were estimated using annual data for Congo; the results are presented in Table 11.[20] The estimated equations all have a relatively high adjusted R-squared. They also pass the Jarque-Bera test for normality of residuals, and the standard diagnostic tests provide no indication of problems regarding serial correlation or heteroscedasticity of the residuals at the standard 5 percent significance level. Moreover, the Wald lag exclusion test shows that the second lag of the first-differenced variables in the cointegrating vector are jointly statistically insignificant in the VECM model.

The key findings from the empirical analysis are as follows:

- The real effective exchange rate is cointegrated with the world oil price, with a higher oil price leading to an appreciation of the real effective exchange rate, both in the short run and over the long-run. More specifically, over the long run a 1 percent increase in the real price of oil is associated with an appreciation of the real effective exchange rate of around 0.2 percent.

- The estimated coefficient on the lagged residual from the cointegrating vector suggests that about 20 percent of the gap between the actual and 'equilibrium' long-run real effective exchange rate is eliminated every year, implying that (in the absence of further shocks) about half of the gap would be closed within three years. For comparison, in the case of South Africa, the empirical estimates presented in MacDonald and Ricci (2003) is consistent with half of the gap being closed within two and two-and-a-half years.

[19] The unit root test results are available from the authors upon request.

[20] Models were also estimated with the (log of) the real GDP per capita relative to trading partners in the cointegrating vector, but the results were less robust.

Table 11. VECM Estimation of the Real Effective Exchange Rate

Variable	Equation 13		Equation 14		Equation 15		Equation 16	
	Co-efficient	t-statistic	Co-efficient	t-statistic	Co-efficient	t-statistic	Co-efficient	t-statistic
	Estimates of the long-run cointegrating relationship with the Real Effective Exchange Rate							
(Log of the real effective exchange rate) $_{t-1}$	1.000		1.000		1.000		1.000	
Constant	-3.987		-3.917		-4.164		-3.953	
(Log of oil price, U.S.$ per barrel, deflated by G7 export price deflator) $_{t-1}$	-0.181	-3.218	-0.204	-2.587	-0.123	-2.622	-0.192	-3.105
	Estimates of short-run real effective exchange rate dynamics							
Temporary dummy for 1994 devaluation	-0.221	-5.413	-0.235	-5.408	-0.228	-5.622	-0.224	-5.440
Permanent dummy for 1994 devaluation	-0.088	-2.804	-0.065	-1.960	-0.086	-2.891	-0.077	-2.533
Δ((Log of the real effective exchange rate) $_{t-1}$)	0.343	2.832	0.282	2.482	0.321	2.875	0.288	2.554
Δ((Log of the real effective exchange rate) $_{t-3}$)	-0.201	-2.454	-0.182	-2.280	-0.198	-2.362	-0.179	-2.254
Δ((Log of oil price, U.S.$ per barrel, deflated by G7 export price deflator) $_{t-1}$)	0.067	3.137	0.078	2.864	0.080	3.533	0.065	3.012
Δ((Log of real GDP per capita relative to trading partners) $_{t-1}$)	-0.529	-5.069	-0.533	-4.952	-0.510	-5.110	-0.518	-4.933
(NFA of banking system) $_{t-2}$ 1/	0.187	3.231	0.177	2.997	0.170	3.005	0.182	3.121
(Openness Measure) $_{t-1}$	0.418	3.346	0.436	3.462	0.411	3.284	0.430	3.475
(Openness Measure) $_{t-2}$	-0.375	-3.432	-0.383	-3.440	-0.366	-3.408	-0.377	-3.422
(Basic primary balance) $_{t-1}$ 2/	-0.164	-1.137						
(Total government expenditures) $_{t-1}$ 2/			0.108	0.811				
(Total government domestically-financed primary expenditures) $_{t-1}$ 2/					0.217	1.400		
Co-efficient on cointegrating vector	-0.293	-2.979	-0.167	-2.236	-0.281	-3.265	-0.205	-3.027
Constant	-0.008	-0.230	-0.065	-1.161	-0.066	-1.287	-0.025	-0.818
Estimation period	1972-2003		1972-2003		1972-2003		1972-2003	
Adjusted R-squared	0.839		0.833		0.846		0.836	
Jarque-Bera Normality test (p-value)							0.124	
LM Serial Correlation test (Lag 1, p-value)							0.051	
LM Serial Correlation test (Lag 2, p-value)							0.570	
LM Serial Correlation test (Lag 3, p-value)							0.658	
VEC Residual Heteroscedasticity test (p-value)							0.426	
VEC Lag Exclusion Wald Test (Δlag 1, p-value)							0.001	
VEC Lag Exclusion Wald Test (Δlag 2, p-value)							0.451	

1/ In ratio to imports of goods and services.
2/ In ratio to GDP.

- The fiscal variables do not seem to have a statistically significant impact on the real effective exchange rate, even in the short run. This may reflect a large share of tradables, and in particular imports, in total government spending, implying that changes in government expenditures have relatively marginal effects on the nontraded sector.[21]

- Contrary to what one might expect, the results suggest that a higher real GDP per capita relative to trading partners is associated with a depreciation of the real effective exchange rate in the short run. This could be because, in a country like Congo, this variable may reflect, not so much productivity differentials with trading partners, but rather movements in income from the oil sector. In the short run this income may be spent mostly on imports, worsening the current account. If the income elasticity to import is greater than one in the short run, an increase in real GDP per capita relative to trading partners would put downward pressure on the real effective exchange rate.

- The results also indicate that an increase in openness initially results in an appreciation of the real effective exchange rate, but that this effect dies away quickly over time. These results may stem from the fact that our measure of openness is an imperfect proxy, and could reflect movements in oil exports relative to GDP rather than developments relating to changes in the trade regime per se.

In short, the empirical results show a strong link between world oil price and the real effective exchange rate, both in the short run and in the long run, with movements in the real effective exchange rate in turn having important repercussions on both total and non-oil GDP growth. However, the transmission mechanism through which oil prices affect the real effective exchange rate is a puzzle. Given the predominance of foreign oil companies and of the state in the oil sector, the most plausible transmission mechanism would have been through government domestic spending. Since all of the fiscal variables are statistically insignificant, the only remaining mechanism appears to be wealth effects of changes in the value of the country's oil resources on spending by the private sector, but much of this spending is likely to fall on imports rather than non-tradables. This is an issue on which further research would be useful.

VIII. Conclusions and Policy Implications

Congo has an economy heavily dependent on oil, and this paper has addressed how dependence on oil has affected its economic growth, both directly and indirectly. The results

[21] The results did not change much when the equations were reestimated with the fiscal variables (basic primary fiscal balance, total government expenditures, total government domestically financed primary expenditures) measured as a share of non-oil GDP.

presented here do not provide empirical support for the hypothesis that the oil sector has had any *direct* spillover effects, either positive or negative, on growth of the non-oil sector. However, development of the oil sector may have had *indirect* effects on non-oil growth, along the following channels.

First, the growth results indicate that political instability has had a significant negative effect on growth of the non-oil sector. The presence of oil could have fueled civil conflict and political unrest in at least two ways, namely by being associated with weakening institutions and rising corruption, and by providing a source of finance to rebel groups. Development of the oil sector may also have fuelled "grievance" by increasing the volatility of the economy through greater exposure to shocks in the world oil market.

To the extent that political instability is at least partly fuelled by a widespread perception that the country's oil resources are being mismanaged, a key policy implication relates to the need to develop high quality institutions to ensure, among other things, the rule of law, an efficient bureaucracy, and low corruption. Improving transparency in the oil sector to ensure full mobilization of government oil revenue and proper and adequate tracking and monitoring of public spending at all levels is key in this regard. In this context it is relevant to note that the government publicly announced in June 2004 its commitment to adhere to the Extractive Industries Transparency Initiative (EITI), and has been making progress, albeit slowly, toward full participation in this initiative.

Second, and more concretely, the real effective exchange rate estimates, combined with the results from estimation of the growth equations, provide empirical support for the hypothesis that increases in the world market price of oil have affected growth of both total GDP and non-oil GDP through appreciation of the real effective exchange rate. In particular, the empirical results suggest that, over the long run, a 1 percent increase in the real world market price of oil is associated with an appreciation of the real effective exchange rate of around 0.2 percent, with negative effects on growth for at least two years.

However, the transmission mechanism through which oil prices affect the real effective exchange rate is unclear. The most plausible transmission mechanism would have been through government domestic spending, given the predominance of foreign oil companies and of the state in the oil sector. However, the fiscal variables are statistically insignificant in the estimation of the real effective exchange rate; the most likely explanation here is that the incidence of government spending falls mainly on imports. The only remaining mechanism appears to be wealth effects of changes in the value of the country's oil resources on private sector spending, but much of this spending is likely to fall on imports rather than nontradables. This is an issue on which further research would be useful. At the same time the real effective exchange rate has not exhibited a trend appreciation over the past four decades, suggesting that other offsetting factors have been at play, including the 1994 devaluation and movements in the net foreign assets of the banking system.

Given the peg of the CFA franc to the euro, there is little that can be done directly to tackle the problem of real effective exchange rate appreciation when the price of oil rises in world markets. However, the results presented in this paper underscore the need to adopt measures to mitigate the negative repercussions on growth through structural reforms that help promote

investment and growth in the economy (particularly in the non-oil sector). The negative growth effects can also be partly offset by ensuring that higher spending from oil revenue windfalls is utilized effectively to expand the productive potential of the economy, for example by developing the country's physical infrastructure and human capital. Having been confronted with three successive and intense conflicts, which destroyed a significant part of the basic infrastructure, Congo continues to suffer from a lack of adequate physical capital. To the extent that higher government oil revenues are spent on imports, this will also help to offset appreciation of the real effective exchange rate. In addition, international debt relief would complement the country's own efforts at mobilizing resources to raise spending aimed at increasing the country's productive capacity.

The empirical growth results also show that an improvement in the basic primary fiscal balance lowers real GDP growth contemporaneously, but is conducive to higher growth over the medium term. One interpretation of this result is that, in the short run, fiscal consolidation has the standard Keynesian effects on employment and growth, but over time it may promote investment and growth by lowering the cost of funds for private investment and by enhancing the credibility of the government for effectively managing the macroeconomy (and more specifically the country's public finances).

At present there is no specific fiscal framework designed to ensure effective use of oil revenues in the Republic of Congo. It is thus advisable that the country authorities establish a medium-term budget framework consistent with sustainable management of the country's oil resources. This would entail regular updates of oil reserves and production schedules to obtain reasonable estimates of the country's permanent income from oil. These estimates should figure prominently in the annual budget discussions on how much of current oil revenues to save for future generations, weighing also considerations of immediate pressing spending needs against absorptive capacity constraints.

List of Acronyms

$BudY_t$	Central government primary fiscal balance as ratio to GDP
$DOILX_t$	(Change in) the value of oil exports in GDP
$DOILY_t$	(Change in) the share of the oil sector in real GDP
$GEXP_t$	Total government expenditures as ratio to GDP
$GPRIEXP_t$	Total government domestically-financed primary expenditures as ratio to GDP
L_t	Labor force
K_t	Capital stock
k_t	(Natural logarithm of) physical capital per worker
Kg_t	First difference of the natural logarithm of physical capital per worker (total economy)
$K^{NO}g_t$	First difference of the natural logarithm of physical capital per worker in the non-oil sector
$LOILPRICER_t$	(Natural logarithm of) the world oil price, in U.S. dollars per barrel, deflated by the export price deflator for the G7 group of industrialized countries
$LREXR_t$	(Natural logarithm of) the real effective exchange rate
$LRPCGDP_t$	(Natural logarithm of) real GDP per capita relative to Congo's trading partners
$NFAMGS_t$	Net foreign assets of the banking system as a ratio to exports of goods and services
$OPEN_t$	Openness measure (ratio to GDP of the sum of exports and imports of goods)
PI_t	Dummy variable taking the value of 1 in years where there is a coup or armed civil conflict
$RERg_t$	First difference of the natural log of the real effective exchange rate
$TOTg_t$	First difference of the natural log of the terms of trade;
Y_t	Output (GDP at constant prices)
y_t	(Natural logarithm of) output per worker
Yg_t	First difference of the natural log of real GDP per worker (total economy)
$Y^{NO}g_t$	First difference of the natural log of real GDP per worker in the non-oil sector

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