2009

Metals or Management? Explaining Africa's Recent Economic Growth Spurt

Laura Nyantung Beny
University of Michigan Law School, lbeny@umich.edu

Lisa D. Cook
Michigan State University, lisacook@msu.edu

American Economic Review: Papers & Proceedings 2009, 99:2, 268–274
http://www.aeaweb.org/articles.php?doi=10.1257/aer.99.2.268

Metals or Management? Explaining Africa's Recent Economic Growth Performance

By LAURA N. BENY AND LISA D. COOK*

Explanations for Africa's poor long-run growth performance have varied over time. The theories examined include geography (Jeffrey D. Sachs and Andrew Warner 1997); institutions (William Easterly and Ross Levine 1997; Daron Acemoglu, Simon Johnson, and James Robinson 2001, 2002; Nathan Nunn 2007, 2008); health (David Bloom and Sachs 1998; Gregory N. Price 2003); and economic dependency (William Darity 1982). More recently, economists have attempted to explain what *The Economist* has called Africa's new "period of unparalleled economic success" (*The Economist* 2008a, 33). Average annual real GDP growth was 1.8 percent between 1980 and 1989 and increased to 4.4 percent between 2000 and 2005. Per head, real growth in Africa fell by 1.1 percent between 1980 and 1989 and increased 2.1 percent between 2000 and 2005 (World Bank 2007a). This recent reversal of fortune may stem from the broad economic reforms that many African countries instituted during the 1990s, especially macroeconomic stabilization and financial-market liberalization. But it may also be due to the recent boom in international prices of oil, copper, and other primary commodities that constitute a significant fraction of Africa's exports (International Monetary Fund (IMF) 2006).

*Beny: University of Michigan Law School, 625 South State St., Ann Arbor, MI 48109–1215 (e-mail: lbeny@umich.edu); Cook: Department of Economics and James Madison College, Michigan State University, 110 Marshall-Adams Hall, East Lansing, MI 48824 (e-mail: lisacook@msu.edu). They are grateful to Brahima Coulibaly, William Darity, Jr., Peter Henry, and participants in seminars at Michigan State University, the University of Michigan, and the 2009 American Economic Association Annual Meeting for insightful comments and suggestions. They are also grateful to Andrew McCallum for excellent research assistance. Beny gratefully acknowledges financial support from the Cook Fund at the University of Michigan Law School. Cook gratefully acknowledges the generous financial support of the African Studies Center at Michigan State University.

With newly available data extending through 2005,[1] we investigate whether international commodity price increases (our "metals" hypothesis) or policy reforms (our "management" hypothesis) have driven Africa's recent performance. In doing so, we supplement existing accounts of Africa's recent success (see Benno J. Ndulu and Stephen A. O'Connell 2007; John Page and Jorge S. Arbache 2008, for example).[2] Our results, based on cross-country growth regressions, suggest that both "metals" and "management" have contributed to Africa's recent reversal of economic fortune.

The article proceeds as follows. Section I briefly describes our data and methodology. Section II presents the results, and Section III concludes.

I. Data and Methodology

Data on growth in output per capita and other country-level characteristics for 239 countries are available for the period 1960 to 2005 in the World Bank *Africa Development Indicators* (ADI) and *World Development Indicators* (WDI) (World Bank 2007a, b). We supplement these data with country-level data from other sources. It is possible to use the ADI and WDI to explore changes in growth performance in African countries before and after the significant policy and commodity-export changes in the 1990s. We expect both good policy and luck to covary with higher rates of economic growth.

[1] These data include the World Bank ADI (World Bank 2007a).

[2] A shortcoming of these accounts is that, while they are somewhat informative with respect to the type of economic management that is correlated with Africa's recent economic performance, they are less informative about the type of exports and international trade underlying such performance. We address this shortcoming by accounting for both export composition and policy in our analyses of African growth.

In particular, we estimate OLS difference-in-differences panel models of the form:

$$(1)\quad \Delta \mathbf{y}_{it} = \alpha_0 + \gamma_1 Africa_i + \gamma_2 Africa \times Year\ 1995_{it} + \gamma_3 metals\ Africa \times Year\ 1995 \times metals_{it}\zeta + \mathbf{X}_{it}\beta + \delta_t + \varepsilon_{it},$$

where $\Delta \mathbf{y}_{it}$ is the half-decadal moving average growth of GDP per capita for country i in year t, δ_t is a year dummy, and ε_{it} is a random error term.[3] The elements of $\mathbf{X}$ are controls for demand and supply of exports—export and trade-partner trade-weighted GDP growth from Vivek Arora and Athanasios Vamvakidis (2005); the dependency ratio (a demographic factor and measure of labor productivity);[4] latitude[5] from Centre d'Etudes Prospectives et d'Informations Internationales (CEPII) (2008); an Africa indicator (from the United Nations Commodity Trade Statistics Database 2008); year dummies (1960 is the excluded year); and initial income.

To test the "metals" hypothesis, *metals* includes each of the following alternative trade measures: agricultural exports as a fraction of GDP; ore and mineral exports as a fraction of GDP; petroleum and petroleum exports as a fraction of GDP; and the barter terms of trade. We also estimate OLS difference-in-differences panel models of the form:

$$(2)\quad \Delta \mathbf{y}_{it} = \alpha_0 + \gamma_1 Africa_i + \gamma_2 Africa \times Year\ 1995_{it} + \gamma_3 management \times Africa \times Year\ 1995 \times management_{it}\eta + \mathbf{X}_{it}\beta + \delta_t + \varepsilon_{it}.$$

To test the "management" hypothesis, *management* includes each of the following alternative measures of macroeconomic policy and institutional quality:[6] final government consumption as a fraction of GDP; the rate of inflation (GDP deflator); the black market premium calculated from end-of-year official and black-market exchange rates (from Carmen Reinhart and Kenneth Rogoff 2005); and the Property Rights Index from the *Index of Economic Freedom*, a measure of the general quality of economic management and institutions, particularly the enforcement of laws.

The coefficients of special interest are those on the interaction terms, represented by ζ in equation (1) and η in equation (2), which measure the differential impact of "metals" and "management" on economic growth between African and non-African countries from 1995.

II. Results

The regressions in Table 1 test our "metals" hypothesis by including commodity and trade variables. All columns present OLS difference-in-differences estimates. In column 1, the coefficient on the interaction between the Africa and 1995 dummies is positive and suggests that after the mid-1990s Africa fared relatively better than the rest of the world; however, it is not significant. In column 2, the coefficients on the petroleum export terms are negative, suggestive of "Dutch disease" (W. Max Corden and J. Peter Neary 1982), but they are insignificant.[7] The

[3] We build on the cross-country growth regression analyses of Robert J. Barro (1991), Sachs and Warner (1997), and Ricardo Hausmann, Jason Hwang, and Dani Rodrik (2007), among others. See Jeffrey Wooldridge (2002) for an extensive treatment of difference-in-differences estimation. While the regressions presented here include half-decadal moving averages, models are estimated in the entire sample with similar results. Alternative tests, e.g., first-differencing and generalized least squares (cross-sectional time series), were also implemented to control for persistence in the data and fixed country effects. The results presented in this article are consistent with those using alternative specifications.

[4] Other demographic factors, such as life expectancy and labor force participation, were used in tests not reported here. The inclusion of one set of demographic controls or another does not affect the results.

[5] Due to space constraints, the reported results exclude latitude. However, the results are generally the same whether we include or exclude latitude from the regressions.

[6] On the significance of institutions to Africa's economic performance, see Acemoglu, Johnson, and Robinson (2001, 2002), Price (2003), and Nunn (2007, 2008).

[7] In unreported OLS random effects regressions, we find that the coefficient on exports of petroleum and related products relative to GDP is negative and significant. However, in the same regression, the coefficient on the interaction of this measure with exports of goods and services as a fraction of GDP is positive and significant. This result suggests

TABLE 1—"METALS" (COMMODITY BOOM) TESTS: DIFFERENCE-IN-DIFFERENCES REGRESSIONS
(Dependent variable: GDP growth, per capita, 1960–2005)

Regressor	(1)	(2)	(3)	(4)	(5)
Dependency ratio	−4.714***	−4.157***	−4.191***	−4.356***	−5.476***
	(1.378)	(0.961)	(0.934)	(1.345)	(1.081)
Trade-partner growth, annual percent	−0.151	0.366*	0.101	0.657***	0.005
	(0.215)	(0.188)	(0.184)	(0.218)	(0.197)
Export growth, annual percent	0.181***	0.248***	0.201***	0.201***	0.183***
	(0.030)	(0.043)	(0.025)	(0.032)	(0.030)
Africa dummy	−1.060*	−0.854**	−1.028***	−0.239	−0.786**
	(0.610)	(0.392)	(0.388)	(0.624)	(0.400)
GDP per capita in 1960, (current USD)	−0.001**	−0.001***	−0.001***	−0.001**	−0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Year = 1995	−1.385**	−0.322	−1.294**	0.151	−1.485***
	(0.600)	(0.566)	(0.546)	(0.362)	(0.562)
Exports, agricultural raw materials, percent GDP					0.003
					(0.012)
Exports, ores and minerals, percent GDP			−0.018**		
			(0.008)		
Exports, petroleum and petroleum products, percent GDP		−0.055			
		(0.045)			
Terms of trade, 2000 = 100				−0.008*	
				(0.005)	
Africa dummy × 1995	0.930				
	(0.580)				
Africa dummy × 1995 × petroleum exports, percent GDP		−0.045			
		(0.124)			
Africa dummy × 1995 × ore exports, percent GDP			0.036*		
			(0.022)		
Africa dummy × 1995 × terms of trade				−0.001	
				(0.006)	
Africa dummy × 1995 × agricultural exports, percent GDP					0.035***
					(0.014)
Observations	513	395	472	250	473

Notes: Standard errors robust to clustering are reported below estimated coefficients. All models are estimated as difference-in-differences OLS models. Year dummies are included, but only the coefficient for the 1995 year dummy is reported. An intercept term is also included in estimation but is not reported. Variable definitions and sources are given in text.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

negative and significant coefficient on ore and mineral exports relative to GDP in column 3 is also consistent with Dutch disease. By contrast, the coefficient on the interaction between ore and mineral exports and the Africa and 1995 dummies in column 3 are positive and significant, which supports our "metals" hypothesis for Africa. In column 4, the coefficient on the terms of trade is negative and significant, as expected, while the coefficient on the interaction between this variable and the Africa and 1995 dummies is insignificant. Finally, the regression in column 5 broadly supports our commodities-boom hypothesis in that the coefficient on the interaction among 1995, Africa, and agricultural exports as a fraction of GDP is positive and significant. The recent commodities boom

that, while exporting petroleum alone is negatively correlated with economic growth (again suggestive of Dutch disease), exporting these products in conjunction with goods and services, i.e., export diversification, is positively correlated with economic growth (see, for example, Ndulu and O'Connell 2007; IMF 2006).

TABLE 2—"MANAGEMENT" (POLICY) TESTS: OLS AND DIFFERENCE-IN-DIFFERENCES REGRESSIONS
(*Dependent variable: GDP growth, per capita*, 1960–2005)

Regressor	(1)	(2)	(3)	(4)	(5)
Dependency ratio	−4.714***	−4.796***	−4.379***	−5.227***	−2.706
	(1.378)	(1.280)	(1.436)	(1.007)	(1.808)
Trade-partner growth, annual percent	−0.151	−0.065	−0.171	0.103	−0.032
	(0.215)	(0.205)	(0.214)	(0.234)	(0.230)
Export growth, annual percent	0.181***	0.179***	0.179***	0.226***	0.157***
	(0.030)	(0.030)	(0.030)	(0.034)	(0.036)
Africa dummy	−1.060*	−0.967*	−1.208*	−0.316	−0.784
	(0.610)	(0.552)	(0.661)	(0.604)	(0.591)
GDP per capita in 1960, (current USD)	−0.001**	−0.000	−0.001**	−0.001***	−0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Year = 1995	−1.385**	−0.841	−1.366**	−1.476**	0.685**
	(0.600)	(0.588)	(0.598)	(0.692)	(0.313)
Government spending, percent GDP		−0.095***			
		(0.036)			
Inflation rate			−0.002***		
			(0.000)		
Black market premium				−0.001	
				(0.002)	
Property rights					0.000
					(0.017)
Africa dummy × 1995	0.930				
	(0.580)				
Africa dummy × 1995 × government spending, percent GDP		0.089**			
		(0.038)			
Africa dummy × 1995 × inflation rate			0.116***		
			(0.038)		
Africa dummy × 1995 × black market premium				0.033***	
				(0.011)	
Africa dummy × 1995 × property rights					0.016
					(0.012)
Observations	513	511	513	353	117

Notes: Standard errors robust to clustering are reported below estimated coefficients. All models are estimated as difference-in-differences OLS models. Year dummies are included, but only the coefficient for the 1995 year dummy is reported. An intercept term is also included in estimation but is not reported. Variable definitions and sources are given in text.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

in Africa affected both petroleum and mineral and nonpetroleum and nonmineral primary commodity exports (IMF 2006), so this result is not surprising.

The regressions presented in Table 2 examine our "management" hypothesis by adding policy measures. All columns present OLS difference-in-differences regressions. In column 2, while the coefficient on government spending is negative and significant, the coefficient on the interaction of government spending and the Africa and 1995 dummies is positive and significant. This result suggests that after 1995 government spending in Africa may have aided in increasing living standards relative to prior years and other countries, possibly a reflection of more productive spending by African governments, e.g., on health and infrastructure, which is correlated with productivity and economic growth (see also Sachs and Warner 1997). In column 3, the positive and significant coefficient on the interaction among inflation and the Africa and 1995 dummies likely reflects the fact that higher rates of inflation were correlated

TABLE 3—"METALS" VERSUS "MANAGEMENT": DIFFERENCE-IN-DIFFERENCES REGRESSIONS
(Dependent variable: GDP growth, per capita, 1960–2005)

Regressor	(1)	(2)	(3)	(4)	(5)	(6)
Dependency ratio	−5.559***	−4.401***	−5.282***	−4.125***	−5.656***	−5.372***
	(1.106)	(0.933)	(1.000)	(0.862)	(1.006)	(1.015)
Trade-partner growth, annual percent	0.045	0.145	−0.023	0.069	0.170	0.155
	(0.195)	(0.179)	(0.192)	(0.181)	(0.205)	(0.200)
Export growth, annual percent	0.182***	0.199***	0.183***	0.200***	0.221***	0.218***
	(0.030)	(0.025)	(0.030)	(0.025)	(0.033)	(0.033)
Africa dummy	−0.823*	−1.039***	−0.975***	−1.166***	−0.110	−0.227
	(0.434)	(0.401)	(0.371)	(0.362)	(0.525)	(0.530)
GDP per capita in 1960, (current USD)	−0.001**	−0.000**	−0.001***	−0.001***	−0.001***	−0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Year = 1995	−1.042**	−0.916*	−1.428**	−1.280**	−1.765***	−1.863***
	(0.520)	(0.522)	(0.559)	(0.544)	(0.583)	(0.582)
Government spending	−0.057**	−0.047				
	(0.029)	(0.029)				
Africa dummy × 1995 × government spending	0.090**	0.099***				
	(0.038)	(0.037)				
Exports, agricultural raw materials, percent GDP	0.007		0.005		0.000	
	(0.012)		(0.011)		(0.013)	
Africa dummy × 1995 × agricultural exports, percent GDP	0.007		0.028**		0.025**	
	(0.016)		(0.014)		(0.012)	
Exports, ores and minerals, percent GDP		−0.016*		−0.016**		−0.020*
		(0.008)		(0.007)		(0.010)
Africa dummy × 1995 × ore exports, percent GDP		−0.001		0.026		0.133***
		(0.028)		(0.021)		(0.051)
Inflation rate			−0.002***	−0.002***		
			(0.000)	(0.000)		
Africa dummy × 1995 × inflation rate			0.093**	0.100**		
			(0.041)	(0.043)		
Black market premium					−0.003	−0.003
					(0.002)	(0.002)
Africa dummy × 1995 × black market premium					0.031***	0.032***
					(0.011)	(0.011)
Observations	472	471	473	472	335	335

Notes: Standard errors robust to clustering are reported below estimated coefficients. All models are estimated as OLS models. Year dummies are included, but only the coefficient for the 1995 year dummy is reported. Variable definitions and sources are given in text.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

with economic growth in African countries. In other words, a greater part of price increases in Africa after 1995 may have been the "good" inflation that accompanies economic growth. Similarly, the result in column 4 implies that the impact of the black market premium was more benign in Africa after 1995 relative to other countries. Finally, the property rights measures in column 5 are insignificant, possibly a result of insufficient observations.

Table 3 presents results from testing the "metals" and "management" hypotheses simultaneously. Commodity and trade variables include mineral and ore exports and agricultural exports, relative to GDP. Policy variables include government spending, the inflation rate, and the

black market premium. In columns 1 and 2 "management" dominates "metals." The coefficients on the terms interacted with government spending positively and significantly covary with economic growth, whereas the terms interacted with mineral and agricultural exports are not significant at conventional levels. "Management" and "metals" in column 3 are both significant; specifically, the coefficients on both the inflation and agriculture interaction terms are positive and significant. However, the coefficient on the former is of larger magnitude than the coefficient on the latter. In column 4, the "management" effect clearly dominates the "metals" effect. In particular, the coefficient on the inflation interaction term is positive and significant, while the coefficient on the ore and minerals interaction term is insignificant (albeit positive).

When considering the black market premium in columns 5 and 6, neither "metals" nor "management" consistently dominates. The coefficient on the black market premium interaction term remains positive and significant at the 1 percent level of significance. At the same time, the coefficients on the interacted commodity variables are highly significant. For agricultural exports (column 5), it is less clear which effect is larger since the coefficients are approximately the same size. With respect to ore and mineral exports (column 6), the magnitude of the coefficient on its interaction term is one order of magnitude larger than that on the premium variable.

Overall, the results in Table 3 are generally consistent with the findings in the separate "management" and "metals" regressions. It is difficult to conclude decisively whether policy reforms or commodity-price fluctuations have been more influential with respect to Africa's recent growth spurt. Rather, it seems that both have mattered.

III. Conclusion and Future Research

We have exploited recently available data on African economic growth to understand whether policy reform ("management") or the recent commodity boom ("metals") better explains Africa's recent growth experience. Our results suggest that both factors have contributed to Africa's recent reversal of fortune. These findings are broadly consistent with those in the related empirical literature. We believe this study is timely and important. Commodity booms are typically followed by commodity busts, as demonstrated by the IMF (2006). If better economic management has played any positive role, it may be critical for protecting gains in growth outcomes and higher living standards when commodity prices eventually fall.

While we have been careful to minimize problems associated with using country-level data in estimation, we are aware of the limitations of cross-country regression analysis, such as reverse causation, multicollinearity, and heterogeneity.[8] Given the resulting problems of interpretation, future research may include country case studies to circumvent such problems and corroborate our results. It would also be interesting to revisit our "management" and "metals" tests a few years hence, after the current global financial and economic crises have evolved and once data are available (see also *The Economist* 2008b).

REFERENCES

Acemoglu, Daron, Simon Johnson, and James A. Robinson. 2001. "The Colonial Origins of Comparative Development: An Empirical Investigation." *American Economic Review*, 91(5): 1369–1401.

Acemoglu, Daron, Simon Johnson, and James A. Robinson. 2002. "Reversal of Fortune: Geography and Institutions in the Making of the Modern World Income Distribution." *Quarterly Journal of Economics*, 117(4): 1231–94.

Arora, Vivek, and Athanasios Vamvakidis. 2005. "The Implications of South African Economic Growth for the Rest of Africa." *South African Journal of Economics*, 73(2): 229–42.

Barro, Robert J. 1991. "Economic Growth in a Cross Section of Countries." *Quarterly Journal of Economics*, 106(2): 407–43.

Berthelemy, Jean-Claude, and Ludvig Soderling. 2001. "The Role of Capital Accumulation, Adjustment and Structural Change for Economic Take-Off: Empirical Evidence from African Growth Episodes." *World Development*, 29(2): 323–43.

Bloom, David E., and Jeffrey D. Sachs. 1998. "Geography, Demography, and Economic

[8] See N. Gregory Mankiw (1995) and Jonathan Temple (1999) for a rich discussion of problems arising in cross-country regressions related to instrumental variables and heterogeneity.

Growth in Africa." *Brookings Papers on Economic Activity,* 2: 207–73.

Centre d'Etudes Prospectives et d'Informations Internationales (CEPII). 2008. Geographic Distances Database. http://www.cepii.fr/anglaisgraph/bdd/distances/htm (accessed December 2008).

Corden, W. Max, and J. Peter Neary. 1982. "Booming Sector and De-Industrialisation in a Small Open Economy." *Economic Journal,* 92(368): 825–48.

Darity, William, Jr. 1982. "On the Long-Run Outcome of the Lewis-Nurkse International Growth Process." *Journal of Development Economics,* 10(3): 271–78.

Easterly, William, and Ross Levine. 1997. "Africa's Growth Tragedy: Policies and Ethnic Divisions." *Quarterly Journal of Economics,* 112(4): 1203–50.

Economist. 2008a. "Opportunity Knocks," October 11, 33–36.

Economist. 2008b. "Africa's Economy: Trying to Weather the Storm," November 1, 56–57.

Hausmann, Ricardo, Jason Hwang, and Dani Rodrik. 2007. "What You Export Matters." *Journal of Economic Growth,* 12(1): 1–25.

Heritage Foundation. 2008. *Index of Economic Freedom, 1995-2005.* http://www.heritage.org/Index/ (accessed December 2008).

International Monetary Fund. 2006. "Regional Economic Outlook, Sub-Saharan Africa." Washington, DC: International Monetary Fund.

Mankiw, N. Gregory. 1995. "The Growth of Nations." *Brookings Papers on Economic Activity,* 1: 275–310.

Ndulu, Benno J., and Stephen A. O'Connell. 2007. "Policy Plus: African Growth Performance, 1960 to 2000," In *Challenges of African Growth: Opportunities, Constraints, and Strategic Decisions.* Washington, DC: World Bank.

Nunn, Nathan. 2007. "Historical Legacies: A Model Linking Africa's Past to Its Current Underdevelopment." *Journal of Development Economics,* 83(1): 157–75.

Nunn, Nathan. 2008. "The Long-Term Effects of Africa's Slave Trades." *Quarterly Journal of Economics,* 123(1): 139–76.

Page, John, and Jorge Saba Arbache. 2007. "Patterns of Long Term Growth in Sub-Saharan Africa." The World Bank Policy Research Working Paper 4398.

Price, Gregory N. 2003. "Economic Growth in a Cross-Section of Nonindustrial Countries: Does Colonial Heritage Matter for Africa?" *Review of Development Economics,* 7(3): 478–95.

Reinhart, Carmen M., and Kenneth S. Rogoff. 2004. "The Modern History of Exchange Rate Arrangements: A Reinterpretation." *Quarterly Journal of Economics,* 119(1): 1–48.

Sachs, Jeffrey D., and Andrew M. Warner. 1997. "Sources of Slow Growth in African Economies." *Journal of African Economies,* 6(3): 335–76.

Temple, Jonathan. 1999. "The New Growth Evidence." *Journal of Economic Literature,* 37(1): 112–56.

United Nations. Commodity Trade Statistics Database. http://comtrade.un.org/ (accessed December 2008).

Wooldridge, Jeffrey. 2002. *Econometric Analysis of Cross Section and Panel Data.* Cambridge, MA: MIT Press.

World Bank. 2007a. *Africa Development Indicators.* Washington, DC: World Bank.

World Bank. 2007b. *World Development Indicators.* Washington, DC: World Bank.