CHAPTER 1

Human Capital in Resource-Rich Countries

Abstract
Natural resource wealth has helped to drive up national income in many Sub-Saharan African countries. Although modestly lower in resource-rich countries, poverty is higher after factoring in gross national income per capita, suggesting that resource wealth is not generally shared. Countries rich in natural resources fare particularly badly in terms of education and health outcomes—school participation and completion rates are far below those that national income would predict; infant mortality and stunting rates are also higher, and vaccination rates are lower. Resource-rich countries invest less in education and health than their national income would predict, and their investments tend to be only weakly associated with better outcomes.

Introduction
Over the past 15 years, Sub-Saharan Africa (SSA) has experienced a boom in natural resources, and virtually all countries in the region are exploring new oil, natural gas, or mineral reserves. The region’s exports of oil alone are nearly triple its aid receipts (van der Ploeg and Venables 2011). Countries that had not previously been considered resource-rich are seeing a windfall of resource rents. Ghana’s Jubilee oil field, which entered production in 2010, averages more than 85,000 barrels a day, and Uganda’s Lake Albert rift fields target production of 200,000 barrels a day. Natural gas exploitation could potentially bring returns of billions of dollars to Mozambique and Tanzania.

Natural resources hold promise of being a great boon to economic growth and individual well-being, but numerous studies point to the economic as well as the social, political, and institutional challenges that accompany natural resource riches (Africa Progress Panel 2013; Venables 2016). The specter of a “resource curse” shrounds the promise (Sachs and Warner 1999, 2001). But the success of several countries—Chile, Malaysia, and Norway, for example—in transforming
natural resources into long-term development suggests that such a curse is not
inevitable (Lederman and Maloney 2007). Harnessing the returns from natural
resource wealth can contribute substantially to eradicating extreme poverty and
enhancing shared prosperity.

Success requires a series of good decisions and sound implementation. Recent
decreases in oil prices highlight just one of the risks associated with growth driven
by natural resource wealth. Revenues from natural resources are volatile, and
government strategies for managing these resources need to take into account the
possibility of busts as well as booms and to address the challenge of transforming
finite, volatile resources into sources of growth (figure 1.1).

Governments and other stakeholders must grapple with (at least) four central
questions when they seek to transform a finite amount of natural resources into
lasting development (Barma and others 2012; van der Ploeg and Venables 2011;
Venables 2016):

1. What is the optimal contract between government and entities that extract
natural resources to balance public benefits with incentives to the private
sector?
2. What is the optimal timing of extraction to ensure the maximum stream of
benefits from reserves?
3. What is the optimal portfolio allocation of mineral revenues between
consumption, savings, and investments? And what should be the profile of
investments with regard to financial assets, physical capital (for example, infra-
structure), and human capital?
4. How can resource revenue be spent most effectively and efficiently, and what
complementary activities or reforms are required to ensure effectiveness and
efficiency?

Answers to these questions determine whether the benefits of natural resource
extraction will last through the long term. This book focuses on questions 3
and 4, exploring, in particular, how long-term benefits can be achieved by invest-
ing in human capital—in part because this issue is too often overlooked.

As the book makes clear, investing in human capital—understood broadly
to include education, capabilities, and health—should be a central part of
the strategy for converting natural resources into long-term development. It
extends the time horizon of the natural resource windfall by converting a
finite resource into a form of capital that can be preserved through genera-
tions, it helps to promote growth by distributing wealth broadly, and it helps
to lay the foundation for broad-based economic development as natural
resource revenues decline.

However, investing well in human capital is hard; the track record of using
natural resource wealth to lessen poverty and promote better education and health
outcomes is not good. Moreover, because resource-rich countries tend not to
spend much on human capital, and, because the challenges in delivering services
are exacerbated in these countries, the outcomes are not impressive. Spending wisely and directly confronting challenges that are unique to natural-resource-rich countries are both essential for success.

**Natural Resource Wealth, National Income, Poverty, and Inequality**

Natural resource wealth—and oil wealth in particular—has been supporting dramatic growth in national incomes in SSA countries. Between 1995 and 2013, gross national income (GNI) per capita in the region as a whole rose 50 percent. The gain was 80 percent in oil-rich countries, but substantially lower, at 40 percent, in non-resource-rich countries (figure 1.2). Countries identified as “potentially” resource-rich (with reserves identified but not yet extracted) also grew quickly (70 percent over the period), although this was from a much lower base and annual increases in income were smaller. Box 1.1 presents the country classifications.

This chapter assesses the extent to which the higher national income resulting from this growth is associated with higher human capital outcomes and less inequality in those outcomes. It then assesses patterns of investment in human capital by different types of countries. The chapter uses new databases built from individual and household-level surveys to contrast levels and inequalities in outcomes between resource-rich and non-resource-rich countries, both within and beyond Sub-Saharan Africa.
Natural resource wealth is closely associated with higher national income in Sub-Saharan Africa (figure 1.3). Average GNI per capita in 2013 was US$4,528 in oil-rich countries and US$2,607 in nonoil resource-rich countries, compared with US$1,683 in non–resource-rich countries. In the last group, it is noteworthy that countries identified as potentially resource-rich tend to have substantially

**Figure 1.2** In SSA, Oil-Rich Countries Grew Substantially Faster Than Other Countries: Cumulative Growth in GNI per Capita, 1995–2013

<table>
<thead>
<tr>
<th>Year</th>
<th>Non-SSA</th>
<th>SSA, non-resource-rich</th>
<th>SSA, non-resource-rich, potential</th>
<th>SSA, resource-rich, nonoil</th>
<th>SSA, resource-rich, oil</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>1.0</td>
<td>1.1</td>
<td>1.4</td>
<td>1.9</td>
<td>2.1</td>
</tr>
<tr>
<td>2000</td>
<td>1.3</td>
<td>1.6</td>
<td>1.8</td>
<td>2.4</td>
<td>2.6</td>
</tr>
<tr>
<td>2005</td>
<td>1.6</td>
<td>1.9</td>
<td>2.1</td>
<td>2.9</td>
<td>3.0</td>
</tr>
<tr>
<td>2010</td>
<td>1.9</td>
<td>2.1</td>
<td>2.3</td>
<td>3.1</td>
<td>3.2</td>
</tr>
<tr>
<td>2015</td>
<td>2.0</td>
<td>2.2</td>
<td>2.4</td>
<td>3.2</td>
<td>3.3</td>
</tr>
</tbody>
</table>

**Source:** World Development Indicators data.

**Note:** SSA = Sub-Saharan Africa; GNI = gross national income. Non-SSA countries include only countries with GNI per capita of less than US$10,000 in 1995 (in 2005 U.S. dollars).

**Box 1.1 Country Classification**

This book classifies countries into subgroups by their resource endowments (table B1.1.1). The classification is based on the analysis described in IMF (2012), which defines countries as resource-rich if they had either natural resource revenue of at least 20 percent of total revenue or natural resource exports of at least 20 percent of total exports for 2006–10. The classification includes some countries for which data are lacking (Côte d’Ivoire, Liberia, Niger, and Uzbekistan) and is augmented by Namibia and South Africa based on later analyses of World Development Indicators data (Filmer and Denisova 2015). Countries identified as potentially resource-rich are those with identified reserves where production has not begun or reached significant levels.
## Box 1.1 Country Classification (continued)

### Table B1.1.1 Countries Classified as Resource-Rich or Potentially Resource-Rich

<table>
<thead>
<tr>
<th>Country</th>
<th>Oil</th>
<th>Resource</th>
<th>Nonoil</th>
<th>Resource</th>
<th>Country</th>
<th>Oil</th>
<th>Resource</th>
<th>Nonoil</th>
<th>Resource</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angola</td>
<td>Oil</td>
<td></td>
<td>Botswana</td>
<td>Diamonds</td>
<td>Central African Republic</td>
<td>Diamonds, gold</td>
<td></td>
<td>Ghana</td>
<td>Gold, oil</td>
</tr>
<tr>
<td>Cameroon</td>
<td>Oil</td>
<td></td>
<td>Congo, Dem. Rep.</td>
<td>Minerals, oil</td>
<td>Ghana</td>
<td>Gold, oil</td>
<td></td>
<td></td>
<td>Algeria</td>
</tr>
<tr>
<td>Chad</td>
<td>Oil</td>
<td></td>
<td>Guinea</td>
<td>Mining products</td>
<td>Madagascar</td>
<td>Oil, natural gas, minerals</td>
<td></td>
<td></td>
<td>Azerbaijan</td>
</tr>
<tr>
<td>Congo, Rep.</td>
<td>Oil</td>
<td></td>
<td>Liberia</td>
<td>Gold, diamonds, iron</td>
<td>Mozambique</td>
<td>Natural gas, bauxite, other</td>
<td></td>
<td></td>
<td>Bahrain</td>
</tr>
<tr>
<td>Côte d'Ivoire</td>
<td>Oil, natural gas</td>
<td></td>
<td>Mali</td>
<td>Gold</td>
<td>Sienna Leone</td>
<td>Diamonds</td>
<td></td>
<td>Ecuador</td>
<td>Oil</td>
</tr>
<tr>
<td>Equatorial Guinea</td>
<td>Oil</td>
<td></td>
<td>Mauritania</td>
<td>Iron</td>
<td>Tanzania</td>
<td>Gold, precious stones</td>
<td>Indonesia</td>
<td>Oil</td>
<td>Mongolia</td>
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<td>Gabon</td>
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<td></td>
<td>Namibia</td>
<td>Minerals</td>
<td>Togo</td>
<td>Phosphate Oil</td>
<td>Iran, Islamic Rep.</td>
<td>Oil</td>
<td>Peru</td>
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<td>Uranium</td>
<td>Uganda</td>
<td>Oil</td>
<td>Iraq</td>
<td>Oil</td>
<td>Qatar</td>
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<td>Sudan</td>
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<td>South Africa</td>
<td>Minerals</td>
<td>Missouri</td>
<td>Oil, natural gas</td>
<td>Albania</td>
<td>Oil, Oil, natural gas</td>
<td>Suriname</td>
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<tr>
<td>Zambia</td>
<td>Copper</td>
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<td></td>
<td></td>
<td>Kazakhstan</td>
<td>Oil</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Botswana</td>
<td>Diamonds</td>
<td></td>
<td></td>
<td></td>
<td>Libya</td>
<td>Oil</td>
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<td></td>
<td>Mexico</td>
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<td></td>
<td>Oman</td>
<td>Oil</td>
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</table>
Table B1.1.1 Countries Classified as Resource-Rich or Potentially Resource-Rich (continued)

<table>
<thead>
<tr>
<th>Country</th>
<th>Resource-rich</th>
<th>Non-SSA</th>
<th>Resource-rich</th>
<th>Nonoil</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Oil</td>
<td>Nonoil</td>
<td>Potentially resource-rich</td>
<td></td>
</tr>
<tr>
<td>Papua New Guinea</td>
<td>Oil, copper, gold</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Russian Federation</td>
<td>Oil</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>Oil</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Syrian Arab Republic</td>
<td>Oil</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Timor-Leste</td>
<td>Oil</td>
<td></td>
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<td></td>
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<tr>
<td>Turkmenistan</td>
<td>Oil</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>United Arab Emirates</td>
<td>Oil</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Venezuela, RB</td>
<td>Oil</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Vietnam</td>
<td>Oil</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yemen, Rep.</td>
<td>Oil</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: IMF 2012, except for Namibia and South Africa, which were added based on later analysis.

Note: The non-resource-rich countries in Sub-Saharan Africa (SSA) are Benin, Burkina Faso, Burundi, Cabo Verde, the Comoros, Eritrea, Ethiopia, The Gambia, Guinea-Bissau, Kenya, Lesotho, Malawi, Mauritius, Rwanda, Senegal, the Seychelles, Somalia, South Sudan, Swaziland, and Zimbabwe.
Figure 1.3 Natural Resource Wealth in SSA Generally Translates into Higher GNI per Capita: GNI per Capita, by Country Classification, 2013

Source: World Development Indicators data.
Note: SSA = Sub-Saharan Africa; GNI = gross national income.
Figure 1.4 In SSA, Natural Resource Wealth Is Associated with Slightly Lower Poverty Rates: Share of the Population Living on Less Than US$1.25, US$2.50, and US$5 a Day, Most Recent Data Available

Source: PovCalNet data (extracted May 2015).
Note: SSA = Sub-Saharan Africa. Horizontal bars show mean poverty rates across countries in each grouping.
lower national income (US$776) than countries identified as not having potential resources (US$2,113). The countries that have the potential for large windfalls from natural resource extraction are starting from a substantially lower base.

Poverty rates, in contrast to national income, are only slightly lower in countries rich in natural resources (Christiaensen and Devarajan 2013). While extreme poverty in SSA, measured as the share of the population living on less than US$1.25 a day, tends to be lower in resource-rich than in non-resource-rich countries, the contrast is much smaller when the poverty threshold is set at US$2.50 a day (figure 1.4). At this threshold, average poverty is 33 percent in oil-rich SSA countries, compared with 45 percent in nonoil resource-rich countries and 46 percent in non–resource-rich countries in the region.²

The modest improvement in poverty is reversed after national income is taken into account; poverty reduction is worse in resource-rich countries than in other countries at the same income level. Figure 1.5 shows the differences by country classification after adjusting for GNI per capita. Poverty rates are higher in the resource-rich countries and significantly higher in oil-rich countries at the US$5-a-day poverty threshold.

**Figure 1.5 Resource Wealth Is Not Associated with Substantially Lower Poverty: Headcount Poverty Rates Relative to Non–Resource-Rich SSA Countries at a Poverty Threshold of US$2.50 a Day (Poverty Rates, by Country Category, after Controlling for GNI per Capita, Most Recent Data Available)**

![Figure 1.5](image-url)

Source: Analysis of PovCalNet data (extracted May 2015).

Note: SSA = Sub-Saharan Africa; GNI = gross national income.
This is consistent with patterns of structural transformation in the region. Growth has been less poverty-reducing in SSA than in other parts of the world, and growth in resource-rich countries has reduced poverty less than growth in other countries (Chuhan-Pole 2013). Moreover, in SSA growth in agriculture and services—where the majority of poor people work—tends to result in larger reductions in poverty than growth in industry, which includes mining (figure 1.6; also see Chuhan-Pole 2014; Filmer and Fox 2014).

Whether or not a country is rich in natural resources is not systematically associated with broad measures of inequality, such as the share of income controlled by the top decile or quintile or the Gini index, which measures inequality across the entire income distribution. Inequality tends to be slightly lower in oil-rich countries and slightly higher in nonoil resource-rich countries compared with other countries in the region, but this surprising finding may have more to do with how inequality is measured than with actual inequality. Surveys used to measure household consumption often (a) fail to capture the high levels of consumption among the wealthiest and (b) exclude the wealthiest from the sample completely. Both effects would tend to underestimate inequality, especially in countries where a very few individuals control most of the wealth. This appears indeed to be the case in SSA, especially in resource-rich countries (Beegle and others 2016).

**Figure 1.6** Workers in Industry Have Higher Levels of Education Than Workers in Agriculture or the Unpaid or Self-Employed Services Sector: Percentage of Workers at Each Education Level in Selected African Countries, by Type of Employment

<table>
<thead>
<tr>
<th>Country</th>
<th>Agriculture</th>
<th>Services—unpaid or self-employed</th>
<th>Services—paid or employer</th>
<th>Public sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angola</td>
<td>Blue</td>
<td>Brown</td>
<td>Green</td>
<td>White</td>
</tr>
<tr>
<td>Botswana</td>
<td>Blue</td>
<td>Brown</td>
<td>Green</td>
<td>White</td>
</tr>
<tr>
<td>Sierra Leone</td>
<td>Blue</td>
<td>Brown</td>
<td>Green</td>
<td>White</td>
</tr>
<tr>
<td>Zambia</td>
<td>Blue</td>
<td>Brown</td>
<td>Green</td>
<td>White</td>
</tr>
</tbody>
</table>

*Source:* Analysis of i2d2 database.
Natural Resource Wealth and Human Development

This book is concerned mainly with the link between natural resource wealth and the accumulation of human capital. The rest of this chapter first reviews evidence on levels and inequalities in human capital outcomes in SSA and then turns to indicators of government investment—and its effectiveness—in education and health.

Despite exceptions like Chile, Malaysia, and Norway, natural-resource-rich countries have often been charged with not investing enough in education and health to build a solid foundation of human capital (Birdsall, Pinckney, and Sabot 2001; Bravo-Ortega and de Gregorio 2007; Gylfason 2001; Philippot 2010). This observation is consistent with the cross-country data; SSA countries that are oil-rich fare poorly on the United Nation’s human development index (HDI), which integrates national income, life expectancy, educational attainment, and school participation. For each level of GNI per capita, oil-rich countries in SSA have consistently lower HDIs than other countries both inside and outside the region (figure 1.7).

![Figure 1.7 Resource-Rich Countries in SSA Fare Poorly on the Human Development Index: HDI and GNI per Capita, by Country Category, 2013](image_url)

Source: Analysis of data from UNDP 2014 and World Development Indicators database.

Note: SSA = Sub-Saharan Africa; HDI = human development index; GNI = gross national income.
**Education and Health Outcomes**

Household surveys provide a wealth of new data that can be used to analyze both systematic patterns in education and health outcomes and within-country inequalities in outcomes (box 1.2). The data are compiled primarily from the Demographic Health Surveys (DHS) and Multiple Indicator Cluster Surveys (MICS) as well as other household surveys, such as those collected through the Living Standards Measurement Study (LSMS) program.

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**Box 1.2 New Data on Inequalities in Education and Health Indicators**

International databases on education and health outcomes typically suffer from two problems. First, they only contain country aggregates, which precludes analysis of within-country inequalities in outcomes. Second, the data are often “smoothed” and interpolated in ways that may induce regularities that are functions of the modeling used for smoothing and interpolating rather than actual patterns (for example, if national income is used to predict a variable, subsequent associations between that variable and national income will be spurious). Both problems are overcome here by using new compilations of data based directly on household surveys.

For education outcomes, the book uses data from the Educational Attainment and Enrollment around the World database, which contains indicators from 504 surveys from 109 countries that are derived from analyses of data from the DHS, MICS, the i2d2 database, and other national household surveys. This database covers 41 SSA countries (208 surveys) and 68 non-SSA countries (296 surveys). Of the 41 SSA countries, 7 are oil-rich, 10 are nonoil resource-rich, 9 are non–resource-rich with potential, and 15 are non–resource-rich. Of the 68 non-SSA countries, 13 are oil-rich, 8 are nonoil resource-rich, and 47 are non–resource-rich. Of the comparator countries, 13 are in East Asia and the Pacific, 17 are in Europe and Central Asia, 21 are in Latin America and the Caribbean, 9 are in the Middle East and North Africa, and 9 are in South Asia.

The household survey–derived indicators of education are as follows:

- The proportion of children ages 6–14 years reported to be in school, and
- The proportion of teens ages 15–19 years who have completed grade 6.

For health outcomes, the book uses the database compiled for Wagstaff, Bredenkamp, and Buisman (2014), who made it available for this analysis. It combines data from the DHS and MICS and was augmented with data from the MICS interactive website. This database covers 44 SSA countries (161 surveys) and 57 non-SSA countries (175 surveys). Of the 44 SSA countries, 8 are oil-rich, 10 are nonoil resource-rich, 9 are non–resource-rich with potential, and 17 are non–resource-rich. Of the 57 non-SSA countries, 13 are oil-rich, 7 are nonoil resource-rich, and 37 are non–resource-rich. Of the comparator countries, 9 are in East Asia and the Pacific, 14 are in Europe and Central Asia, 17 are in Latin America and the Caribbean, 10 are in the Middle East and North Africa, and 7 are in South Asia.

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box continues next page
Box 1.2 New Data on Inequalities in Education and Health Indicators (continued)

The household survey–derived indicators of health are as follows:

- Infant mortality rate (number of deaths of children younger than age 12 months per 1,000 live births)
- Proportion of children with a full course of vaccinations (proportion ages 12–23 months who received Bacillus Calmette-Guerin (BCD), measles, and three doses of polio and diphtheria, pertussis, and tetanus (DPT), vaccines)
- Proportion of children who are stunted (children younger than 5 years old with a height-for-age z-score less than 2 standard deviations from the reference median).

a. For the Educational Attainment and Enrollment around the World database, see econ.worldbank.org/projects/edattain/.  
b. For the MICS website, see http://mics.unicef.org/ and for the DHS website, see http://dhsprogram.org.

Education Indicators

Two indicators capture different aspects of education performance in these countries:

1. **School participation**: the probability that a child age 6–14 is reported as currently attending school. The measure combines both household factors that affect enrollment rates (for example, financial constraints or low demand for poor-quality schooling) as well as supply-side factors (for example, availability of schools).

2. **School attainment**: the probability that a young person age 15–19 years has completed grade 6. Among determinants of this completion rate are not only the demand and supply factors that affect enrollment but also the factors that affect school retention. Indeed, in many countries initial enrollment in school is high, but, as a result of dropouts and repetition, completion of grade 6 is much lower, especially for the poor (figure 1.8).

To assess how outcomes differ by country classification, subgroup outcomes are compared, with non–resource-rich SSA countries as the reference group and controlling for national income. The analysis is carried out for each indicator first for the entire population and then by quintile.

Controlling for national income, education outcomes are systematically worse in oil-rich SSA countries than in non–resource-rich SSA countries. The percentage of children ages 6–15 years who are currently attending school and the percentage of young persons age 15–19 years who have completed grade 6 are 7–8 percentage points lower in oil-rich than in non–resource-rich countries compared with what would be expected for their level of income (figure 1.9). This pattern is more pronounced among the poor—for children and youth in the poorest quintile, the shortfall is 15–20 percentage points—although the association cuts across all household welfare levels. The pattern of results is similar, although more muted, in nonoil resource-rich countries. There, school completion is similar
to that of non–resource-rich countries, but school participation is systematically worse, although statistically not significantly so.

The education shortfall in Africa’s resource-rich countries is all the more striking because there is no shortfall in resource-rich countries in other parts of the world. In countries outside SSA, grade 6 completion is systematically higher in resource-rich than in non–resource-rich countries (again, after accounting for GNI per capita). The enrollment rate is similar in oil-rich and in non–resource-rich countries, and it is significantly higher in nonoil resource-rich countries.

Health Indicators
Three measures of health and nutrition can be derived from the household survey data:

1. **Infant mortality:** This measure is typically calculated based on live births within the 10 years before the survey.
2. **Full vaccination coverage:** This indicator largely reflects the effort of the national health system because a full course of vaccinations requires sustained connection to that system (for example, to complete the course of three doses for polio and DPT).
3. **Stunting:** This indicator is a chronic, cumulative measure that is higher when children face repeated periods of low early child nutrition, bouts of sickness, and subsequent low levels of nutrition. Stunting reflects issues that go beyond a country’s health sector. Nevertheless, it also captures the ability of the health sector to help the country to overcome problems.

Figure 1.8 Patterns of Grade Completion Vary Dramatically across Countries: Grade Completion Rate (Proportion) among Young Persons Ages 15–19 Years, by Country

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Source: Educational Attainment around the World database.
Figure 1.9 In SSA, Resource-Rich Countries Have Worse Education Outcomes after Controlling for GNI per Capita: Education Outcomes Relative to Non–Resource-Rich SSA Countries, Overall and by Quintile

a. Probability of children ages 6–14 years being in school

b. Proportion of young persons age 15–19 years who have completed grade 6

Note: SSA = Sub-Saharan Africa; GNI = gross national income. Figures report coefficients from regression models for per capita GNI and its square. Reference category is non–resource-rich SSA countries. Significance level: * = 10 percent.
Within-country inequalities in health indicators can be very large. For example, in Nigeria almost 60 percent of children from the richest quintile have received a full course of vaccinations, compared with almost none from the poorest quintile (figure 1.10).

Cross-country patterns for health are similar to those for education. Infant mortality rates are 30 percent higher in oil-rich SSA countries than in the non-resource-rich countries (figure 1.11), again factoring in that national income is higher in those countries and mortality would therefore be predicted to be lower; infant mortality rates in nonoil resource-rich countries are 14 percent higher. Vaccination rates are also substantially lower: the number of children ages 12–13 months who have had their full course of vaccinations is more than 30 percentage points lower in oil-rich SSA countries than in non-resource-rich countries after controlling for national income; for nonoil resource-rich countries, coverage is about 15 percentage points lower. The proportion of children who are stunted is also significantly higher in oil-rich countries. For each of these indicators, the pattern is more pronounced in the poorest quintiles.

**Inequalities in Education and Health Indicators**

To assess just how strong the inequality effects in education and health are, inequality is defined as the difference between the richest and poorest quintiles in each indicator (for infant mortality and stunting, the difference is reversed, since in those cases higher values indicate worse outcomes). The deficit among the poor is systematically larger in oil-rich than in nonoil resource-rich countries (table 1.1). For example, the gap in grade 6 completion is 33 percentage
Figure 1.11  In SSA, Resource-Rich Countries Have Worse Health Indicators Than Other Countries after Controlling for GNI per Capita: Health Outcomes Relative to Non–Resource-Rich SSA Countries, Overall and by Quintile

a. Infant mortality (log)

b. Full vaccination coverage
## Table 1.1 The Deficit among the Poor Is Systematically Larger in Oil-Rich Than in Nonoil Resource-Rich Countries: Gaps between Richest and Poorest Quintiles for Each Indicator

<table>
<thead>
<tr>
<th>Indicator and region</th>
<th>Resource-rich, oil</th>
<th>Resource-rich, nonoil</th>
<th>Non-resource-rich, potential</th>
<th>Non-resource-rich</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>School enrollment</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SSA</td>
<td>0.31</td>
<td>0.26</td>
<td>0.23</td>
<td>0.21</td>
<td>0.24</td>
</tr>
<tr>
<td>Non-SSA</td>
<td>0.13</td>
<td>0.10</td>
<td>—</td>
<td>0.17</td>
<td>0.15</td>
</tr>
<tr>
<td><strong>Grade completion</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SSA</td>
<td>0.48</td>
<td>0.39</td>
<td>0.42</td>
<td>0.33</td>
<td>0.39</td>
</tr>
<tr>
<td>Non-SSA</td>
<td>0.21</td>
<td>0.26</td>
<td>—</td>
<td>0.32</td>
<td>0.29</td>
</tr>
<tr>
<td><strong>Infant mortality rate (log)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SSA</td>
<td>0.48</td>
<td>0.50</td>
<td>0.49</td>
<td>0.41</td>
<td>0.46</td>
</tr>
<tr>
<td>Non-SSA</td>
<td>0.68</td>
<td>1.07</td>
<td>—</td>
<td>0.74</td>
<td>0.78</td>
</tr>
<tr>
<td><strong>Full course of vaccinations</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SSA</td>
<td>0.36</td>
<td>0.23</td>
<td>0.26</td>
<td>0.17</td>
<td>0.24</td>
</tr>
<tr>
<td>Non-SSA</td>
<td>0.18</td>
<td>0.11</td>
<td>—</td>
<td>0.16</td>
<td>0.16</td>
</tr>
<tr>
<td><strong>Stunting</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SSA</td>
<td>0.24</td>
<td>0.19</td>
<td>0.19</td>
<td>0.20</td>
<td>0.20</td>
</tr>
<tr>
<td>Non-SSA</td>
<td>0.14</td>
<td>0.25</td>
<td>—</td>
<td>0.20</td>
<td>0.21</td>
</tr>
</tbody>
</table>

**Note:** SSA = Sub-Saharan Africa; — = not available.
a. Proportion of children ages 6–14 years who are in school.
b. Proportion of young persons ages 15–19 years who have completed grade 6.
points in non–resource-rich SSA countries, compared with 48 percentage points in oil-rich countries and 39 percentage points in nonoil resource-rich countries. The gap in receiving a full course of vaccinations is 17 percentage points in non–resource-rich SSA countries, compared with 36 percentage points in oil-rich countries. This stark pattern of larger inequalities in SSA is not found in the non-SSA sample of countries.

Rich-poor gaps are remarkably large in oil-rich SSA countries for most indicator averages. Figure 1.12 plots the difference between the richest and poorest quintiles for two key indicators—grade 6 completion and full vaccination coverage—against the average value of the indicators in these countries. If at any given average inequalities are high, this will appear as a point toward the top of each chart. Clearly, oil-rich countries stand out as having particularly high inequalities. While inequalities by household welfare are large, other dimensions of inequality—such as those by gender—also tend to be larger in resource-rich countries (box 1.3).

**Data Gaps and Quality of Outcomes**

While the data described so far represent substantial progress in terms of ability to document patterns across countries, further analysis faces severe data limitations. Perhaps most important is the fact that crucial dimensions of human capital accumulation are not measured. In particular, there is minimal information on the quality of schooling as measured by learning assessments.
Box 1.3 Gender Gaps in Education Outcomes

The discussion in this chapter focuses on within-country inequalities related to household income. Other dimensions of inequality also appear to differ systematically between resource-rich and non-resource-rich SSA countries. Gender gaps stand out. The average difference between boys and girls in the school participation of children ages 6–14 years is 21 percentage points in non-resource-rich SSA countries, compared with 31 percentage points in oil-rich countries and 26 percentage points in nonoil resource-rich countries. The differences are starker for grade 6 completion because gender gaps tend to widen at higher levels of schooling. For example, the male-female gap is 33 percentage points in non–resource-rich SSA countries but 47 percentage points in oil-rich SSA countries.

Figure 1.13 Learning in Africa’s Schools Is Lagging: Performance on the TIMSS Tests of Grade 8 Students in Selected Countries

![Graph showing student performance in selected countries](image)

**Source:** Mullis and others 2012.

**Note:** At the TIMSS low benchmark, test takers have “some knowledge of whole numbers and decimals, operations, and basic graphs.” At the intermediate benchmark, they can “apply basic knowledge in a variety of situations.” At the high benchmark, they can “apply knowledge and understanding in a variety of relatively complex situations.”

a. Students in grade 9.

Only three SSA countries—Botswana, Ghana, and South Africa—have participated in the Trends in International Mathematics and Science Study (TIMSS), an internationally benchmarked learning assessment; in this book, Botswana and South Africa are classified as nonoil resource-rich and Ghana is classified as non–resource-rich with potential. Results from this assessment reveal substantial shortfalls in the learning outcomes that Africa’s schools generate (figure 1.13). More than 50 percent of grade 9 students in Botswana and
about 80 percent of grade 8 students in Ghana and grade 9 students in South Africa cannot show that they have “some knowledge of whole numbers and decimals, operations, and basic graphs.” Very few students in these countries can “apply basic knowledge in a variety of situations.” These learning deficits begin early, and, as discussed in chapter 4, early deficits have long-term implications—both for later education outcomes (such as the TIMSS measure in later grades) and in other realms of life.

While this chapter focuses on indicators that are measured consistently in enough countries to establish patterns for resource-rich and non-resource-rich countries, it is important to keep in mind that other, perhaps even more important, indicators cannot be integrated into the analysis. The indicators used here should be viewed as proxies for a broader concept of human capital, as they provide an incomplete picture (see Beegle and others 2016 for a fuller discussion of data needs and challenges in SSA).

**Public Spending on Education and Health in Resource-Rich Countries**

Relative to other types of government engagement and action, the role of public spending in determining outcomes is controversial. On average, public spending on education or health tends to be only loosely related to outcomes (Dreher, Nunnenkamp, and Thiele 2008; Filmer and Pritchett 1999; World Bank 2003). Some analysts have found positive associations between spending and child mortality and school enrollment, although others emphasize that factors like national income or general economic stability are also important (Baldacci and others 2008; Bokhari, Gai, and Gottret 2007).

The average association may be masking factors that make spending more or less effective. For instance, the impact of spending may vary across the income distribution: there is some evidence that spending matters more to improving outcomes for the poor (Bidani and Ravallion 1997). But a second factor is perhaps more pervasive: because spending can be done “well” or “poorly,” there is no guarantee that it will produce better outcomes. Analysts have used direct measures of governance to show its importance in making public spending more effective in both education and health (Rajkumar and Swaroop 2008). Indirect evidence suggests that international assistance to education tends to be more effective than general public spending on education (Dreher, Nunnenkamp, and Thiele 2008); in part because aid is less prone to leakages and tends to be more pro-poor, it is typically dedicated to inputs other than teacher salaries, which form the bulk of public spending on education.

The effectiveness of government expenditures is addressed in more depth in chapter 3, which discusses the types of reforms required to make spending effective, and in chapter 4, which discusses the types of investments that have the highest payoff. The next two sections of this chapter establish patterns in spending on education and health across resource-rich and non-resource-rich countries and assess the extent to which more spending is associated with better outcomes.
Amount of Public Spending on Education and Health

Public spending on both education and health tends to be higher in resource-rich SSA countries than in other SSA countries. On average, governments in oil-rich SSA countries spend US$69 per capita on education, nonoil resource-rich countries spend US$116, non–resource-rich countries spend US$49, and countries “with potential” spend only US$19 (table 1.2). The pattern for per capita public health spending is similar: on a per person basis, resource-rich SSA countries spend, on average, almost twice what non–resource-rich countries do.

The pattern is reversed, however, when public spending is considered as a share of GDP. The percentage of GDP devoted to education and health in oil-rich SSA countries is close to half the amount spent in non–resource-rich SSA countries. This is not the pattern outside SSA, where government spending on education in nonoil resource-rich countries is lower than, and that on health is similar to, government spending in non–resource-rich countries. Figure 1.14 shows spending per capita on each sector (averaged between 2000 and 2013) relative to non–resource-rich SSA countries, after controlling for national income. In both sectors, the oil-rich SSA countries spend about 60 percent less per capita.

Public Spending and Education and Health Outcomes

The relationship between spending and outcomes is typically tenuous. Money can be well-deployed, but that is not always the case. The data assembled so far can be used further to assess the extent to which the association between spending and outcomes is stronger or weaker for resource-rich countries and whether it differs for the poor. The approach used is to estimate the statistical

<table>
<thead>
<tr>
<th>Indicator and country category</th>
<th>Education (average, 2000–13)</th>
<th>Health (average, 2000–13)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SSA</td>
<td>Non-SSA</td>
</tr>
<tr>
<td><strong>Spending per capita</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resource-rich, oil</td>
<td>69</td>
<td>125</td>
</tr>
<tr>
<td>Resource-rich, nonoil</td>
<td>116</td>
<td>99</td>
</tr>
<tr>
<td>Non–resource-rich, potential</td>
<td>19</td>
<td>19</td>
</tr>
<tr>
<td>Non–resource-rich</td>
<td>49</td>
<td>170</td>
</tr>
<tr>
<td>All</td>
<td>62</td>
<td>157</td>
</tr>
<tr>
<td><strong>Spending as a share of GDP</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resource-rich, oil</td>
<td>2.9</td>
<td>4.7</td>
</tr>
<tr>
<td>Resource-rich, nonoil</td>
<td>4.3</td>
<td>4.5</td>
</tr>
<tr>
<td>Non–resource-rich, potential</td>
<td>4.1</td>
<td>4.1</td>
</tr>
<tr>
<td>Non–resource-rich</td>
<td>5.0</td>
<td>4.9</td>
</tr>
<tr>
<td>All</td>
<td>4.3</td>
<td>4.8</td>
</tr>
</tbody>
</table>

Source: World Development Indicators data.
Note: SSA = Sub-Saharan Africa. Data are calculated as an average of nonmissing values for 2000–13. Per capita amounts are expressed in constant 2005 U.S. dollars.
relationship between public spending in each country subgroup (for example, oil-rich SSA countries) and each outcome, in a model that controls for national per capita income, and additional variables that have been shown to be associated with outcomes and whose exclusion might lead to overinterpreting the role of public spending. The variables are income inequality (as measured by the Gini index), the extent of urbanization, ethnic and linguistic fractionalization (drawn from Alesina and others 2003), and the education of adult women in the population (drawn from Barro and Lee 2010), defined as average years of schooling of women ages 15 years and older (to guard against spurious associations, the model is estimated with and without this variable). In general, the findings are consistent with what has been documented elsewhere: there is little evidence that spending, on average, has systematic positive effects on outcomes.

Public spending per capita on education is associated with more children ages 6–14 years being in school and with more young persons ages 15–19 years having completed grade 6, but typically the magnitude of these associations is not statistically significantly different from zero (figure 1.15). For each percentage point increase in per capita education spending in a non–resource-rich SSA
country, enrollment of children ages 6–14 years rises 1.2 percentage points, but more spending on education is not associated with more teenagers finishing grade 6.

The pattern for oil-rich SSA countries suggests that spending on education is significantly associated with higher enrollment, but not with grade 6 completion—a pattern that is starker for children from the poorest quintile. This is the pattern one might expect if spending increases with the number of students who attend school. But the spending is ineffective in that students fail to reach the end of the primary cycle in a timely fashion. In other (nonoil) resource-rich SSA countries, spending on education is not statistically significantly related to either school participation or grade 6 completion.

Public spending on health is likewise only weakly associated with better health outcomes (figure 1.16). In oil-rich SSA countries, a 1 percent increase in spending on health is not statistically significantly associated with lower infant mortality, better vaccination coverage, or less stunting—either overall or for children in the poorest quintile. In the nonoil resource-rich SSA countries, more spending appears to be associated with better vaccination coverage of

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**Figure 1.15** Public Spending on Education Is Not Associated with Statistically Significantly Higher Levels of Grade 6 Completion in Resource-Rich SSA Countries: Association between Public Spending on Education and Education Outcomes, Controlling for Other Factors

**Note:** SSA = Sub-Saharan Africa; GNI = gross national income. Figure reports coefficients from cross-country regression model of outcome on log of public spending on education (2000–13) in each country subgroup. Model controls for per capita GNI and its square and additional country-level variables. "S" indicates that the coefficient is significantly different from that in non-resource-rich SSA countries. Significance level: * = 10 percent.
Figure 1.16  Public Spending on Health Has Only a Weak Association with Better Health Indicators in Resource-Rich SSA Countries: Association between Public Spending on Health and Health Indicators, Controlling for Other Factors

<table>
<thead>
<tr>
<th>Category</th>
<th>Coefficient</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infant mortality (log)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SSA, non-resource-rich</td>
<td>-0.40</td>
<td></td>
</tr>
<tr>
<td>SSA, potential</td>
<td>-0.30</td>
<td></td>
</tr>
<tr>
<td>SSA, resource-rich, oil</td>
<td>-0.20</td>
<td></td>
</tr>
<tr>
<td>SSA, non-resource-rich, oil</td>
<td>-0.15</td>
<td></td>
</tr>
<tr>
<td>SSA, resource-rich, nonoil</td>
<td>-0.05</td>
<td></td>
</tr>
<tr>
<td>SSA, non-resource-rich, nonoil</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>SSA, resource-rich, oil, potential</td>
<td>0.10</td>
<td></td>
</tr>
<tr>
<td>SSA, non-resource-rich, oil, potential</td>
<td>0.20</td>
<td></td>
</tr>
<tr>
<td>SSA, resource-rich, nonoil, potential</td>
<td>0.25</td>
<td></td>
</tr>
<tr>
<td>SSA, non-resource-rich, nonoil, potential</td>
<td>0.30</td>
<td></td>
</tr>
<tr>
<td>SSA, resource-rich, oil, nonoil</td>
<td>0.20</td>
<td></td>
</tr>
<tr>
<td>SSA, non-resource-rich, oil, nonoil</td>
<td>0.15</td>
<td></td>
</tr>
<tr>
<td>SSA, resource-rich, nonoil, nonoil</td>
<td>0.10</td>
<td></td>
</tr>
<tr>
<td>SSA, non-resource-rich, nonoil, nonoil</td>
<td>0.05</td>
<td></td>
</tr>
</tbody>
</table>

Note: SSA = Sub-Saharan Africa; GNI = gross national income. Figure reports coefficients from cross-country regression model of outcome on log of public spending on health (2000–13) in each country subgroup. Model controls for per capita GNI and its square, and additional country-level variables (see text). "S" indicates that the coefficient is significantly different from that in non-resource-rich SSA countries. Significance level: * = 10 percent.
children in the poorest quintile: a 1 percent increase in spending on health is associated with 10 percent higher vaccination coverage for these children.

Public spending on education or health in resource-rich SSA countries fails to translate systematically into sizable improvements in outcomes for either sector. While this is not inconsistent with findings from other parts of the world or with cross-country patterns documented elsewhere, it points to particular challenges for countries that have access to resources that could be invested in their people: the quality of spending is what ensures that investments translate into real improvements in human capital.

Conclusions

This chapter has shown that resource-rich countries in SSA fare poorly in terms of human capital outcomes, spend relatively little on trying to improve those outcomes, and, when they do spend, tend to get little for that investment. The next chapter makes the economic case for why countries should not give up on investing in human capital. Chapter 3 assesses the challenges confronting resource-rich countries in terms of delivering services to help to build human capital and emphasizes the vital roles of institutions, incentives, and information in overcoming those challenges. Chapter 4 then points to the types of investment that should be prioritized to get the highest returns—those that build a solid foundation of human capital that will make future investments more productive.

Notes

1. This chapter draws heavily on a more technical note prepared for this book (Filmer and Denisova 2015).

2. One of the features of resource-rich countries is that there is a gap between GNI per capita (derived from national accounts) and direct measures of per capita consumption on the basis of which poverty estimates are derived. This gap may be due to the different data sources, but household consumption is also an outcome of policies related to resource rent management. Analyses done for this book show that the share of consumption in GDP is lower in resource-rich countries. For example, in Sub-Saharan Africa in 2013, oil-rich countries had a 30 percentage point lower share of household consumption in GDP than non–resource-rich countries. Outside of Sub-Saharan Africa, this difference was 15 percentage points. This gap is a reason to assess the association between resources and national income as well as between resources and poverty.

3. Stijns (2006) argues that this finding is sensitive to the definitions used for natural resource abundance and for human capital. Nonetheless, he finds that the share of natural capital in national wealth and the share of minerals in exports tend to be negatively associated with schooling indicators.

4. Edwards (2015), using an instrumental variables strategy, shows that the negative impact of the size of the mining sector on human development outcomes is causal.

5. Specifically, each outcome (overall and for each quintile) is regressed on dummy variables for each subgroup, GNI per capita, and its square.
6. No SSA country has participated in the Programme for International Student Assessment (PISA) exercise or in the Progress in International Reading Literacy Study (PIRLS), except South Africa, which participated in PIRLS in 2006, but not in 2011.

7. These amounts are averages for 2000–13, expressed in 2005 U.S. dollars.

References


