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Diversification in resource-rich Africa, 1999–2019

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ABSTRACT

We survey the performance of Sub-Saharan Africa's resource-dependent economies from 1999 to 2019, a period covering the commodity price supercycle, which generated enormous rents for natural resource producers. We show despite high overall growth rates, these states failed to convert their windfalls into broader forms of development: their economies diversified more slowly than resource-poor countries in Sub-Saharan Africa; their economies became less complex; their low institutional quality regressed further; and they achieved slower progress on human development than their resource-poor counterparts. Case studies of the top three diversifiers—Botswana, Zambia, and Nigeria—underscore the challenges of diversification. We suggest two broad reasons for these patterns. First, economic diversification, especially export diversification, is intrinsically difficult for low-and-middle income resource-dependent countries, due to both Dutch Disease effects and the isolated product spaces of the oil, gas, and minerals sectors. Second, diversification in resource-dependent states is sensitive to institutional quality, yet institutional quality is sticky and typically constrained by political interests that are hostile to reforms. This implies that the development challenges of oil, gas, and mineral dependent states over the coming decades will be significant and difficult to surmount. We suggest a more modest set of goals focused on diversifying into related activities in the extractives value chain and unrelated sectors in the domestic economy, as well as narrowly-focused efforts to boost non-resource export industries.

1. Introduction

The World Bank's landmark 2000 report, *Can Africa Claim the 21st Century?* highlighted economic diversification as one of the region's four critical goals in the coming decades (Gelb, 2000, 4). Yet for the next fifteen years, the issue of diversification was overlooked: in Africa's least-diverse economies—the oil, gas, and minerals exporters—economic growth was relatively strong, thanks to the largest commodity "supercycle" in a century (Izvorski et al., 2018).

But in late 2014 the supercycle came to an end, and growth in Africa's extractive industries slowed dramatically. At the same time, a global transition away from fossil fuels began, and the fear of slowing demand and stranded assets led to a sharp drop in oil and gas investment (Peszko et al., 2020). For policymakers in Africa's current and aspiring oil and gas producers, the problem of economic diversification became newly salient (Usman and Landry, 2021).

Despite this renewed attention, the causes and consequences of economic diversification are poorly understood (Lashitew et al. 2021). Moreover, the low quality of trade and diversification data has made it difficult to identify cases of diversification "success" and "failure," leaving the empirical record murky (Ross, 2019). As a result, it is difficult to know which countries, if any, can serve as models for policymakers who wish to reduce their countries' dependence on volatile commodity markets, and to foster growth in new, unrelated sectors.

We take stock of the performance of Sub-Saharan Africa's resource-dependent economies over the past two decades, with special attention to the challenges of economic diversification. Our paper begins by defining economic diversification, in both the domestic and export sectors, and considering alternative ways to measure it. In addition to earlier work in development economics, we draw on research on related and unrelated diversification from regional economics and economic geography and show how these overlooked concepts[1] can offer insights into the lack of diversification in resource-rich Africa, and policy options to chart a new way forward.

We then categorize 13 countries in Sub-Saharan Africa as resource-rich, describing their resource dependence and abundance along a vari-

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[1] There are exceptions, of course. Felipe and Hidalgo (2015), for instance, apply the product space methodology to understand diversification in Kazakhstan.

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ety of dimensions. We next measure and describe their performance in economic diversification from 1999 to 2019. Since no single measure can capture all salient components of diversification, we use a variety of measures that reflect changes in non-resource activities, covering domestic production, exports, capital stock, and economic complexity. These measures reflect the conceptualization of diversification as the development of capabilities for economic production *outside of* the resource sector, rather than as simply a measure of the level of resource activity itself. We also examine performance in human and institutional development.

Three patterns stand out. First, resource-dependent economies in general made little relative progress toward export diversification: in both manufacturing and service exports, resource-rich countries grew more slowly than their resource-poor counterparts on a per capita basis. As a group, the resource exporters also had lower economic complexity scores, and their scores dropped further over the last two decades. That said, the median resource-rich country did increase real per capita non-resource exports in each category we examined—indicating that despite their underperformance, resource-rich countries are slowly improving on these measures.

Second, resource-dependent economies in Sub-Saharan Africa made more progress in their domestic economies than they did in export diversification. As a group, they outperformed their resource-poor counterparts in manufacturing. To be sure, some of this growth is enabled or directly related to fortunes in the resource sector, but it nonetheless translates to real economic activity, and such "linkages" represent a legitimate diversification strategy (Farooki and Kaplinsky, 2014) as we note later in the paper. In services and non-resource wealth accumulation, however, resource-poor countries grew faster over the past two decades. Three resource-rich countries—Botswana, Nigeria, and Zambia—outperformed the median resource-poor countries on each dimension.

Third, resource-dependent economies showed only modest or negative progress in human and institutional development. In the human development index, a key indicator of inclusive growth, gains achieved by the resource-rich countries were almost identical to the gains in Africa's non-resource dependent states, which suggests that two decades of resource rents did not result in marginal gains in human development. In institutions and governance, the story was worse: both groups of countries failed to improve in their governance indicators, but all resource-dependent countries—with the exceptions of Botswana and Zambia—have a lower level of institutional performance than the median resource-poor country in Sub-Saharan Africa.

Following the quantitative analysis of diversification, we undertake case studies of the three most successful economies: Botswana, Nigeria, and Zambia. All three countries have a record of diligent planning to promote growth in non-extractive sectors, although this did not lead to significant progress in emerging from resource dependence.

In the conclusion we suggest two related reasons for this failure. One, diversifying resource-dependent economies is inherently difficult due to the challenges of Dutch disease, the isolated product space of resource extraction, and the resulting lack of competitiveness to pursue related diversification from existing capabilities. This tends to lead both business and government to develop capabilities around rent seeking and distribution. The second reason stems from the political economy challenges of the first. Resource-dependent countries have weaker institutions and governance, which fails to enable the sorts of complex and impartial governing of the business environment to enable firms in new sectors to emerge and succeed.

Finally, we discuss policy implications for resource-dependent nations in Sub-Saharan Africa, offering a more modest set of activities that take into account the resource dependency trap described above, and suggest directions for further research.

Our analysis implies that the development challenges of Africa's oil-and-gas dependent states over the coming decades will be large, but may also present opportunities. Declining oil and gas revenues driven by the energy transformation may make room for the more rapid growth of non-extractive sectors but the competitiveness of firms in those new sectors will be conditional on institutional quality. By contrast, mineral-dependent states will have opportunities to profit from the energy transition and the resulting boost in demand for copper, cobalt, and other critical minerals. Their challenge will be to augment their institutional quality against the headwind of political economy interests, and use the growing value of their natural capital to build up human and physical capital. The record of Africa's resource-dependent states during the last commodity boom, however, should serve as a cautionary reminder about how difficult this may be.

2. Diversification

Diversification refers to both the presence or amount of different activities as well as their variety. In business strategy, diversification occurs when firms produce multiple products or services, whether along the value chain or across new goods or services (Ansoff, 1957). In finance, diversification means to have multiple assets in a portfolio whose risks are not perfectly correlated, so that the portfolio as a whole has less variance than individual assets (Samuelson, 1967). The economic trade literature on export diversification focuses on both the number of export products (Hummels and Klenow, 2005) as well as their concentration (e.g. Agosin et al., 2012).

In the study of resource-rich economies, diversification has mostly followed the lead of trade economics by focusing on export quantity and variety, often simplifying variety with a narrow distinction between natural resource activity and non-resource activity. Gylfason, for instance, compares different measures of export variety over time for resource economies, including the IMF's Export Diversification Index and Product Quality Index (Gylfason, 2018). Ross (2019) utilizes export concentration measured from bilateral trade data and finds little diversification among African oil producers. Alsharif et al. (2017) examine the share of non-oil exports in oil-producing countries, noting that in Sub-Saharan Africa the trend is concentrating exports with a falling share of non-oil exports. Lashitew et al. (2021) capture non-resource exports by looking at both manufacturing and services export growth and find that resource-rich countries experienced slower growth in services exports than resource-poor countries, but in fact higher growth in manufacturing exports.

The focus on export diversification may be driven by the presence of detailed, consistent, sectoral data on exports that are not present on domestic production. Given the relatively small share of economic activity devoted to exports, (according to the World Bank (2021a)global ratio of gross exports to GDP is 30%, but the ratio of value-added in trade to global GDP is likely much smaller) export diversification only captures an incomplete picture of a country's overall increase in the quantity and variety of non-resource activity.

There have been some attempts to measure overall economic diversification. Alsharif et al. (2017) examine the share of employment from outside the oil sector as a measure of diversification, though no countries from Sub-Saharan Africa had sufficient data to be used in their analysis. Lashitew et al. (2021) examine sectoral GDP, defining diversification as the increase in manufacturing and services value added for resource-rich countries. In their analysis, resource-rich countries performed worse than resource-poor countries along both dimensions. Finally, Gill et al. (2014) and Izvorski et al., (2018) consider diversification of capital rather than economic activity; diversification in this sense is a move from dependence on natural, non-renewable capital to human capital and infrastructure.

2.1. Related and unrelated diversification

The regional diversification literature distinguishes between "related" and "unrelated" diversification, wherein related activities benefit from similar capabilities of a place (Boschma, 2017). Capabilities at the local level may refer to the region's infrastructure, natural resources, institutional endowment, and knowledge or skills available (Maskell and Malmberg, 1999). Relatedness may be based on technological similarities, inferred "product space" similarities (Hidalgo et al., 2007), or skills required (Boschma, 2017). Using detailed production, export, and patent data, this literature has found that regions, and to some extent countries, have diversified into sectors that are related to their current activities (Boschma and Capone, 2015).

The fundamental problem for resource-rich countries benefiting from related diversification is that oil and mining are isolated in the product space (Hidalgo and Hausmann, 2008). In other words, there are few related goods or services that share the same capabilities, at least as represented through the product space methodology.

What about unrelated diversification, in which regions or countries move into products that require new capabilities or new combinations of existing capabilities? Boschma and Capone (2015) have found that, among developed economies, unrelated diversification is more likely in liberal market economies like the United States, where radical—as opposed to just incremental—innovation is likely. Pinheiro et al. (2018) estimate that countries enter unrelated products only 7% of the time, but when they do they get a small growth bump. Countries amenable to this are at an intermediate level of development and have higher levels of human capital. Looking at US states and studying patent and citation data, Castaldi et al. (2015) finds possibilities for "recombinant" innovation from using previously unrelated technologies in a new product, as well as more standard incremental innovation from related technologies.

Can resource-rich countries in Sub-Saharan Africa benefit from unrelated diversification, when radical innovation is the rarer and potentially more consequential type of innovation? The use of export diversity and patent data in previous studies may fail to capture diversification in nontradable sectors, in which local companies do not need to compete with the global technological frontier. In these sectors, capabilities may be locally relevant—e.g., the ability to finance new investment in the absence of affordable bank lending, and the ability to protect against state predation. In addition, what normally would be viewed as barriers to innovation, such as high transport costs or uncompetitive local markets, might create sufficient innovation rents to allow an existing player to enter a new product category. Moreover, additional pathologies of the resource curse, such as Dutch disease that increases local purchasing power, and the emergence of "consumption cities" that have agglomeration without industrialization (Gollin et al., 2016), may actually enable such recombinant innovation in nontradables.

2.2. Measures of diversification

While most papers in the small literature on diversification in resource-rich developing countries choose one or two particular measures of diversification, we use a variety of measures for each of exports, domestic production, and capital (see Table 1). We do not use detailed regional production or patent data, despite their employment in the economic geography literature, since such data are not available across Sub-Saharan African countries. We also do not use detailed national accounts data on GDP by industry (outside of the case studies), again because of data availability.

While we try to measure economic progress in non-extractive sectors, this does not necessarily imply true diversification: for example, a country's manufacturing and service sectors might be growing due to unsustainable government expenditures funded by resource windfalls.

Table 1
Diversification variables.

Diversification Measure	Source
Export-based	
Manufacturing, exports per capita (constant 2010 US$)	World Development Indicators, authors' calculations
Services, exports per capita (constant 2010 US$)	World Development Indicators, authors' calculations
Food and agriculture, exports per capita (constant 2010 US$)	World Development Indicators, authors' calculations
Economic complexity index	The Growth Lab at Harvard University
Production-based	
Manufacturing, value added per capita (constant 2010 US$)	World Development Indicators, authors' calculations
Services, value added per capita (constant 2010 US$)	World Development Indicators, authors' calculations
Wealth-based	
Total wealth, excluding subsoil natural capital, per capita (constant 2018 US$)	World Bank wealth accounts

Our measures are meant to capture positive developments outside the extractive sector, whether or not they reflect a deeper form of diversification.[2] These measures also do not imply a reduction in resource dependence, since such developments might be matched by equivalent booms in the resource sector. (Besides, it may not be optimal for resource-dependence countries to reduce their dependency *during* a resource price supercycle, since that is precisely the best time to maximize resource revenues.)

We use four measures of exports. Specifically, following Lashitew et al. (2021) we examine manufacturing and services exports per capita. Ross (2019) found that nearly any measure of exports that includes oil production will be contaminated by commodity price changes—creating a false impression of rising or falling diversification when in fact all that may have happened is the price of oil has moved. To these measures we add a third non-resource export measure, agriculture and food exports, recognizing that labour-intensive and globally competitive diversification opportunities for Sub-Saharan African commodity producers may lie in agribusiness (Akiliswaran et al., 2017). All of these export measures are expressed in per capita terms and are sourced from the World Development Indicators (WDI: World Bank, 2021a); thus diversification means that more non-resource product of each type is exported per person in the country. The fourth measure of exports is the economic complexity index (Growth Lab at Harvard University, 2019), which captures a measure of product variety weighted by the diversification of other producers of the same products.

We use two measures of non-resource GDP to measure diversification in the wider economy as opposed to the narrow export sector. Following Lashitew et al. (2021) we consider countries' performance in increasing per capita levels of manufacturing and services value added activity. These measures are also not immune to contamination from trends in the resource sector: some manufacturing activity may just be processing of resource output, and some service activity may be resource-related as well. However, the data are available broadly and may help reveal the level of overall diversification. Moreover, much of the activity that is resource-related represents production *capabilities* in the economy that could be redeployed to non-resource uses following a change in relative opportunities. These data are also sourced from the World Development Indicators (World Bank, 2021a).

[2] For ease of exposition we sometimes refer to exceptional growth in manufacturing and service sectors, which are meant to proxy for the degree of non-extractive production or exports, as "diversification." Conceptually these measures are meant to represent the growth in the capabilities of the economy for non-resource output.

Finally, following Gill et al. (2014) and Izvorski et al., (2018) we use World Bank wealth accounts data (World Bank, 2021b) and express diversification in this dimension as increases in a country's wealth that is derived from all sources except for non-renewable natural capital. Such data closely approximate the concept of country capabilities for diversification.

2.3. Sources of diversification

Where does economic diversification come from? We distinguish between market and policy mechanisms.

Firms may have market reasons to diversify into new products or services. Following Smithian growth dynamics, an increase in productivity from division of labor brings about surplus that can be reinvested into new capital, thus further increasing output (Barkai, 1969). Or, industrial productivity and extensive production may be unleashed by relaxing institutional constraints, as in Deng's rural China (Peng, 1995). This individual or capitalist surplus, combined with the labor that is freed up from the productivity gains, can then be redeployed into new production.

In management theory, diversification of firm activity is one of the basic elements of strategy. Firms diversify to increase revenue, increase market power, reduce risk from supply chains, and when firm capabilities in one set of products or markets allow them to have a plausible competitive advantage in related products or a new market (Rothaermel, 2019). For regional or national economies, sometimes diversification is the result of such firm strategy. Mobile entrepreneurs and firms, for example, have been shown to contribute to unrelated diversification (Boschma, 2017).

Another driver of diversification at the global or national level is innovation. Firms may innovate to escape competition in search of Schumpeterian (innovation) rents (Aghion et al., 2001). In management speak, they may develop new products or services to exit markets characterized by high competition and low margins to enter "blue ocean" areas in which familiar product characteristics may be recombined to seek out new markets (Kim and Mauborgne, 2005). Innovation by definition increases the number of product offerings.

Governments may use policy mechanisms in order to bring about diversification. In resource-rich countries, one classic type of diversification strategy is promoting forward, backward, and horizontal linkages with the resource sector itself (Hirschman, 1958; Farooki and Kaplinsky, 2014). A linkages strategy would seek, almost by definition, related diversification. In the 1960s, import substitution industrialization (ISI) strategy was deployed in Latin American commodity exporters, recycling the tax and foreign exchange income of commodity exports through protected domestic markets and foreign investment to assemble a whole new range of products; while these did not always involve innovation per se, they did result in the creation of new capabilities that could have broader benefits (Perez, 2015). A more contemporary version appropriate to the current, liberalized environment is sector development, in which governments resource new activities and greater competitiveness in specific sectors of the economy with the potential for national or international growth (McKinsey Growth McKinsey Global Institute, 2010). While ISI could bring about unrelated diversification based on consumption habits and global technologies, sector development would normally seek to build on established productive capabilities, thus furthering related diversification.

2.4. Benefits of diversification

Resource-dependent countries stand to gain significantly from diversification, which can explain why it is so frequent a policy recommendation. For one, more diverse economies are richer and are generally expected to converge to a higher level of income (Hidalgo and Hausmann, 2009). Moreover, countries that export a variety of goods and services benefit from reduced aggregate volatility in the same way that diversified financial portfolios should reduce variance. Compare that to countries that are concentrated in natural resource production, where economic shocks emanate from commodity price fluctuations and resource depletion; this volatility can harm growth as well (Van der Ploeg and Poelhekke, 2009).

Three, there are political economy benefits that come from economic diversification. Natural resource wealth, particularly oil, is associated with the so-called resource curse, contributing to authoritarianism, corruption, and violence (Ross, 2015). Firms in the extractive sector and the politically-connected firms that profit off state largesse seek to protect their rents; in contrast, businesses competing through market-based strategies that emerge during diversification are more likely to support inclusive market reforms (Pritchett, Sen, and Werker, 2018a).

Finally, resource dependence can bring about the problem of Dutch disease, which decreases the performance of other export sectors (Harding and Venables, 2016), thus perpetuating the challenges of resource dependence. Diversification that raises export productivity reduces the risk of Dutch disease, again creating a virtuous circle.

Collectively, these benefits of diversification point to the potential for feedback loops and multiple equilibria. Low diversification brings about volatility, low growth potential, self-reinforcing political economy pathologies, and Dutch disease. Increasing diversification should reverse these outcomes and produce ever-improving prospects.

3. Evaluating diversification in resource-dependent Sub-Saharan Africa, 1999–2019

Here we describe how we measure resource wealth and select countries to be included in the resource-rich group.[3] We then evaluate those countries across the measures of diversification discussed in the previous section—non-resource export, production, and capital—and compare them to resource-poor countries in Sub-Saharan Africa. In each category, we label a country "successful" if it performs better than the median resource-poor country in Sub-Saharan Africa. As a check for whether the diversification itself is accompanied by social and political development, we also examine each country's performance over the same period in improving quality of life for its citizens and its governance institutions.

3.1. Measuring resource wealth

There are many ways to measure resource wealth, and the distinctions become important when looking at Sub-Saharan African countries. The principle division across measures is whether one is examining resource *abundance*, which captures some measure of resources per capita, or resource *dependence*, which measures the importance of natural resources in a country's economy. Resource abundance is positively associated with potential drivers of economic diversification (Lashitew et al., 2021), while dependence has a negative effect on development outcomes (Lashitew and Werker, 2020). Our approach is to utilize multiple measures of resource wealth to demonstrate the different dimensions for resource-rich countries, however we will rely on an indicator of resource dependence to drive our categorization of Sub-Saharan African economies. Economic diversification, after all, is a policy solution for resource dependence rather than resource wealth per se. For all indicators, we average the measure over the time period, 1999–2019.

Our primary measure of resource dependence, which we use to categorize countries for the analysis, is the share of natural resource rents in GDP. The World Bank calculates natural resource rents as part of its

[3] In comparing more resource-dependent countries with less resource-dependent countries, we generally use the terms "resource rich" and "resource poor" for ease of exposition.

Changing Wealth of Nations database measured in constant 2010 dollars, which we source from the WDI (World Bank, 2021a). We add rents from oil, gas, and minerals as a share of GDP. This gives a measure of the direct contribution of excess profits from hydrocarbon and mineral extraction to the national economy.

Ranking countries in Sub-Saharan Africa according to this measure, we label all countries with a value of at least 5% of GDP as resource rich. This leads to a list of 12 countries, ranging from the Republic of Congo at nearly 40% of GDP to the Democratic Republic of Congo at 5.3% (see Table 2). The next country on the list, at 4.4% of GDP, is Cameroon. While Cameroon has some oil, it also exports cocoa, coffee, and cotton, and falls well below the average of resource-rich countries along all dimensions. To this list we add Botswana, whose main export, diamonds, does not get counted in the dataset (Lange et al., 2018). Löf et al. (2021) estimate that in 2019 Botswana had the highest diamond rents to GDP in the world at 9.2%, placing it well within the group of resource-rich nations by this measure. The average share of resource rents in GDP for those countries we classify as resource-poor is only 1.1%, with the median share just 0.2%.

Our list of resource-rich countries in Sub-Saharan Africa thus has 13 members. Six of those countries are oil producers nearly contiguously located on the western coast of central Africa: Nigeria, Equatorial Guinea, Gabon, Republic of Congo, Democratic Republic of Congo (DRC), and Angola. Three countries are oil producers contiguously located in the eastern Sahel: Chad, South Sudan, and Sudan. Two are mineral producers in West Africa: Mauritania, with its iron ore and gold, and Guinea, with bauxite and gold (and an immense but untapped iron ore deposit). Finally, there are two additional neighbouring mineral producers in southern Africa: copper-rich Zambia and diamond-rich Botswana. DRC, bordering Zambia, might better be classified as a mineral producer, with copper and cobalt dominating petroleum exports.

To ensure that we are not overlooking important countries we examine three other measures of resource dependence. One is the percentage of total exports constituted by natural resources, which we calculate from WDI data on fuels, metals, and ore exports. Among the group of resource-rich countries with data availability, this measure ranges from 96% in Angola to 42% in Mauritania (with Botswana's figure again being implausibly low). In contrast, the median value for resource-poor Africa is just 6% on this measure. Next, we consider the share of government revenue (excluding grants and social contributions) that comes from resource payments, which showcases the government dependence on extractive activity for domestic revenue mobilization (ICTD/UNU-WIDER, 2020). The most resource-dependent on this measure is Equatorial Guinea, with oil accounting for 87% of revenue raised. The least resource-dependent is Zambia, at only 8%, probably capturing mining's low "take" as compared to oil and gas (Adebayo et al., 2021; Johnston, 2007), especially given the next three resource-rich countries with the lowest government revenue dependence are all mining countries. The median country in resource-poor Africa has 4% of government payments coming from the resource sector. Finally, we consider the share of a country's wealth from non-renewable natural resources, specifically subsoil assets.[4] Total wealth also includes that from renewable resources as well as human capital and built capital, and can be considered a factor to generate future output (World Bank, 2021b). Not surprisingly, resource-rich countries in Sub-Saharan Africa have a higher share of non-renewable assets in total wealth with a median value of 16% compared to just 1% in resource-poor countries, led by Gabon at 39% of total wealth.

We also look at two measures of resource abundance. The first is oil, gas, and mineral rents per capita. The DRC, with its massive population, has the lowest value among resource-rich Sub-Saharan African countries at just $19 per capita—consistent with Izvorski et al., (2018) finding that resource-rich Africa is more dependent than abundant. The high is over $5300 per capita in Equatorial Guinea, and the median value is $200 per capita. Among countries in resource-poor Sub-Saharan Africa, the median value is just $3 per person. The second measure is subsoil assets per capita (this time measured in 2018 dollars), which has the same ranking: DRC's subsoil wealth per capita is just $350, while Equatorial Guinea's is over $55,000, with a median value of $3300 per capita. In contrast, the median in resource-poor countries was just $17 per person in non-renewable wealth.

3.2. Diversification performance

Having identified the group of resource-dependent countries, we track their progress along the different measures of non-resource sector growth described in the previous section. In each measure, we label a country a success if it bests the median performer in resource-poor Sub-Saharan African. The logic of using resource-poor Sub-Saharan Africa as a comparison group is that shared geographic or long-term institutional variables might affect the overall potential for diversification.

To capture the level of diversification as well as the change, we report two figures for each indicator. The first is the level of diversification in 2019 or the otherwise most recent available year of data, which captures the last data point before the global "black swan" event of the coronavirus pandemic. The second figure we report is the improvement over the country's own performance in 1999 (or nearest available year of data).

We first analyze the growth in non-resource exports in Table 3. The first measure is manufacturing exports per capita. In 2019, the median value among resource-rich countries was $52 per capita (in 2010 dollars), compared to $23 in resource-poor countries. That belies substantial heterogeneity, however. Botswana is the most significant exporter at $2222 per capita, with Gabon as the next highest at just $159. The median resource-poor country in Sub-Saharan Africa increased real manufactured exports per capita by 55% since 1999; in contrast, the median resource-rich improver, Botswana, managed just a 3% gain. (Botswana's slight gain hides a change in the composition of its exports as we describe later.) Gabon and Republic of Congo, the next two highest exporters of manufactured goods, experienced a decrease of a half and a third over the past two decades. Nigeria and Mauritania both exported a significantly higher multiple of exports per capita over 1999, but remained at such a low base that it was hardly meaningful from a macroeconomic perspective.

The second measure, service exports per capita, shows a positive but slow trend among the resource-rich countries with a median increase of 18% over the past two decades compared to an 81% median increase among resource-poor countries. Again, Botswana had the highest level of service exports per capita in 2019, at $408 followed by Gabon. Zambia and Sudan had strong growth rates but even after two decades of substantial increases they each booked less than $100 in per capita service exports by 2019, though it was enough to put them over the non-resource median value of $56 per capita.

Of course, being competitive in global manufactures is difficult as a resource-rich country in a part of the world with high transport costs, and trading in global services in the modern knowledge economy is similarly challenging, outside of tourism. A plausible competitive advantage for many countries in Sub-Saharan Africa is food and agriculture production (Akileswaran et al., 2017). Indeed, other resource-rich success stories like Chile and Malaysia also have strong food and agriculture sectors. We thus examine per capita exports in food and agriculture and find, for once, that resource-rich countries had a higher median improvement of 42% as compared to the 18% improvement in resource-poor countries. Resource-rich Sub-Saharan Africa's largest per capita exporter is Gabon with $364 in per capita exports, yet its exports

[4] Izvorski et al. (2018) also use World Bank wealth data to categorize resource-rich countries in Sub-Saharan Africa. However, rather than relying on the share of total wealth from subsoil assets, they rank countries on per-capita natural resource endowment including above-ground resources.

Table 2
Resource wealth by country in Sub-Saharan Africa, 1999–2019.

Country Name	Average hydrocarbon and mineral rents (% GDP), 1999–2019	Average hydrocarbon and mineral rents per capita (constant 2010 US$), 1999–2019	Average natural resource exports (% of total exports), 1999–2019	Average resource revenue (% gvmt revenue excl grants and social contrib)	Average natural capital per capita 2000–18, subsoil assets (constant 2018 US$)	Average nonrenewable capital share of total wealth, 2000–2018
Congo, Rep.	39.7%	$1099	66.0%	72.5%	$10,298	23.1%
Equatorial Guinea	34.9%	$5313		86.7%	$56,044	
Angola	33.2%	$1033	96.4%	74.6%	$11,877	
South Sudan	31.9%	$429		80.8%	$3323	
Gabon	26.6%	$2512	75.4%	52.5%	$34,185	39.4%
Chad	17.0%	$142		56.3%	$1953	17.5%
Nigeria	12.5%	$250	87.3%	70.2%	$4197	16.6%
Mauritania	11.5%	$192	42.0%	27.1%	$3463	16.2%
Sudan	9.9%	$147	72.7%	42.0%	$856	
Zambia	5.9%	$83	65.8%	8.5%	$1179	4.5%
Guinea	5.8%	$41	46.0%	20.8%	$832	13.2%
Congo, Dem. Rep.	5.3%	$19		12.6%	$346	4.1%
Botswana	1.5%	$91	8.5%	42.7%	$1653	2.6%
Average, Resource-rich (excl Botswana)	*19.5%*	*$938*	*69.0%*	*50.4%*	*$10,713*	*16.8%*
Median, Resource-rich	***12.5%***	***$192***	***66.0%***	***52.5%***	***$3323***	***16.2%***
Average, Resource-poor	*1.1%*	*$14*	*11.4%*	*5.8%*	*$264*	*1.2%*
Median, Resource-poor	***0.2%***	***$3***	***6.3%***	***4.2%***	***$17***	***0.8%***

Source: Authors' calculations, data from World Bank (2021a), ICTD/UNU-WIDER (2020), World Bank (2021b)

Table 3
Trade diversification performance in resource-rich Sub-Saharan Africa, 1999–2019.

Country Name	Manufacturing, exports per capita (constant 2010 US$), 2019	Manufacturing exports ratio 2019:1999	Services, exports per capita (constant 2010 US$), 2019	Services exports ratio 2019:1999	Food and agriculture, exports per capita (constant 2010 US$), 2019	Agric exports ratio 2019:1999	Economic complexity index, 2017	Change in Economic complexity index, 1999–2017
Congo, Rep.	$107	0.66	$63	0.41	$77	1.42	−1.67	−0.48
Equatorial Guinea	$52	2.06	$16	0.29	$9	3.90	−1.67	−0.28
Angola			$6	2.79				
South Sudan	$159	0.54	$184	0.29	$364	0.49	−1.08	−0.07
Gabon	$36	18.80	$26	1.18	$6	4.63	−1.70	0.17
Chad	$7	4388.58	$47	1.33	$289	4.73	−1.59	−0.33
Nigeria	$1	0.42	$68	8.32	$21	0.33		
Mauritania	$71	1.39	$72	2.44	$43	0.81	−1.12	−0.65
Sudan	$8	0.42	$7	0.36	$14	3.56	−2.16	−0.30
Zambia			$1	0.14			−1.46	0.14
Guinea								
Congo, Dem. Rep.								
Botswana	$2222	1.03	$408	1.29	$43	0.57	−0.45	−0.01
Average Resource-rich	*$296*	*490.43*	*$82*	*1.71*	*$96*	*2.27*	*−1.43*	*−0.20*
Median Resource-rich	***$52***	***1.03***	***$47***	***1.18***	***$43***	***1.42***	***−1.59***	***−0.28***
Average Resource-poor	*$181*	*58.32*	*$486*	*2.00*	*$228*	*3.04*	*−0.75*	*−0.11*
Median Resource-poor	***$23***	***1.55***	***$56***	***1.81***	***$47***	***1.18***	***−0.67***	***−0.14***

Source: Authors' calculations, data from World Bank (2021a), Growth Lab at Harvard University (2019)

in 2019 were just half of what they had been in 1999. Just behind it and closing quickly was Mauritania, with $289 in per capita exports representing a nearly fivefold increase. Other resource-rich countries mostly had either very low levels of food and agriculture exports per capita, and/or anaemic growth rates. One exception was Republic of Congo, with just $77 in per capita exports, but a solid improvement of 42% since 1999, putting it above the median exports per capita of $47 among resource-poor countries.

Finally we examine progress in economic transformation, as captured by the economic complexity index (ECI). Here both resource-rich

and resource-poor countries had a bad two decades, with a median change in ECI of −0.28 and −0.14 respectively (ECI scores range from around −2 to 3, and higher scores are better). The median ECI in resource-rich countries in Sub-Saharan Africa in 2017 was −1.59, as compared to −0.67 in resource-poor countries. The most complex resource-rich economy by this metric in 2017 was Botswana at −0.45, and the least complex was Guinea at −2.16 (with data gaps for Chad and South Sudan). Nigeria and DRC managed to improve their scores over the time period by 0.17 and 0.14 points respectively, but remained at low bases.

Overall, from a trade basis we see slow gains in non-resource exports per capita among resource-rich countries, but at a significantly slower pace than in resource-poor countries.

In Table 4 we compare non-resource sector performance in the wider economy. Looking at manufacturing value added per capita, we see higher levels of manufacturing activity in resource-rich countries, with a median of $135 per person compared to just $90 in resource-poor countries and a higher growth rate as well. Of course, as with exports, we are worried that some of this manufacturing activity may be capturing limited processing of natural resource production, but the value added measurement here (as opposed to exports, which are measured in gross terms) should help isolate the true economic contribution of simplistic processing activity. Driving that worry is the fact that the top two performers are Gabon and Equatorial Guinea, each with over $2000 per capita of manufacturing activity, and both of which have improved substantially since 1999, although the government-reported figures may reflect a change in definition or otherwise not be reliable. Botswana is a distant third at nearly $500 in per capita manufacturing activity, up 46% since 1999. At the bottom of the rankings is Chad with just $10 in per capita production.

Domestic services activity is a potential area for unrelated diversification. With a median of $806 in real per capita services activity, resource-rich countries experienced median growth of 34% over the past two decades. While impressive, it nonetheless fell short of the improvement in resource-poor countries where the median growth was 56%. Standout performers in resource-rich Sub-Saharan Africa were Nigeria, whose $1237 in per capita services value added was nearly 2.5 times that in 1999, Zambia, an increase of 2.3 times to nearly $1000 per capita, and Botswana, which doubled its service sector to $5000 per capita.

Finally, we measure the levels and improvements in per capita non-resource wealth. Resource-rich Sub-Saharan African countries had a higher median level in 2018, with over $25,000 in non-resource wealth per person as compared to just over $15,000 in the resource-poor group. Yet, again, resource-poor countries were converging: 2018 wealth was 31% higher at the median gain than in 1999, as compared to resource-rich countries that still saw an improvement of 16%. Bucking this trend of underperformance were four countries, three of them minerals exporters: Guinea, Botswana, and Zambia, plus oil-exporting Nigeria. All registered increases of at least 42%. Botswana's non-mineral wealth of $80,000 per person was the highest in continental Africa. Nigeria and Zambia's impressive per capita wealth of over $25,000 was driven in both countries by human capital, with an additional significant role in Zambia of renewable natural capital.

3.3. Things that matter

Diversification, as we measure it for most indicators is more than just a means to an end as it also represents specific increases in sustainable economic activity that can be linked to individual and community-level prosperity. Yet of course prosperity itself is just one component to development, and we wish to see how resource-rich countries in Sub-Saharan Africa have done in a broader sense over the past two decades, and to correlate that with their diversification performance.

One commonly-used measure of overall development is the Human Development Index (or HDI, UNDP, 2021), which is a weighted average of three components: life expectancy at birth, education, and income per capita. To be sure, the last metric is tied to resource production (e.g. higher revenue from resource sales will show up as higher incomes), so the exercise of comparing diversification with progress in the HDI should be interpreted as exploratory. Rather than look at the ratio of

Table 4
Domestic production and capital diversification performance in resource-rich Sub-Saharan Africa, 1999–2019.

Country Name	Manufacturing, value added per capita (constant 2010 US$), 2019	Manufacturing VA ratio 2019:1999	Services, value added per capita (constant 2010 US$), 2019	Services VA ratio 2019:1999	Total wealth excluding nonrenewable, 2018 (constant 2018 US$)	Wealth ratio 2019:1999
Congo, Rep.	$105	1.33	$791	1.40	$36,554	1.16
Equatorial Guinea	$2264	2.00	$3748	1.34		
Angola	$185	1.50	$1430	1.32		
South Sudan	$28	0.99	$445	0.80		
Gabon	$3103	10.35	$3236	1.19	$47,636	0.78
Chad	$10	1.37	$254	1.06	$9028	1.12
Nigeria	$213	1.29	$1237	2.46	$25,657	1.55
Mauritania	$136	0.74	$806	1.79	$16,761	0.96
Sudan			$602	1.54		
Zambia	$135	1.47	$959	2.31	$27,174	1.42
Guinea	$95	1.14	$379	1.28	$6833	1.66
Congo, Dem. Rep.	$70	0.66	$137	1.17	$8620	0.83
Botswana	$499	1.46	$5022	1.99	$80,098	1.58
Average Resource-rich	*$570*	*2.03*	*$1465*	*1.51*	*$28,707*	*1.23*
Median Resource-rich	***$135***	***1.35***	***$806***	***1.34***	***$25,657***	***1.16***
Average Resource-poor	*$260*	*1.40*	*$1347*	*1.73*	*$21,358*	*1.36*
Median Resource-poor	***$90***	***1.17***	***$498***	***1.56***	***$15,073***	***1.31***

Source: Authors' calculations, data from World Bank (2021a), World Bank (2021b)

improvement, since the HDI is capped at 1, we examine the percentage of the gap from a perfect score that a country closed since 1999.

As Table 5 shows, every single country has made positive progress on the HDI, with Botswana and Angola closing 37% and 31% of their gaps, respectively. The highest HDI score among resource-rich countries was Botswana at 0.74, followed by Gabon at 0.70. Chad's 0.40 was the lowest, but it had nonetheless closed 15% of the HDI gap since 1999. The median resource-rich country HDI score was 0.55, slightly higher than the median score of 0.53 among resource-poor countries; however, the median gap closed by resource-rich countries was 20%, compared to 22% in resource-poor countries. Although the figures are similar across these two groups, the underlying differences go in the same direction as for diversification: resource-poor countries sustained greater progress from a lower starting point.

Institutional and governance quality can contribute to longer-term prosperity through a country's organizational capabilities to govern the more complex economy that diversification brings about, noting the observed negative relationship between natural resource wealth and institutional quality (Ross, 2015; Lashitew and Werker, 2020). To capture broad trends in institutional and governance quality, we average the scores of all six of the World Bank's Worldwide Governance Indicators (World Bank, 2021c). The scores cover a country's control of corruption, government effectiveness, political stability and absence of violence/terrorism, regulatory quality, rule of law, and voice and accountability, and range from −2.5 to 2.5. As with the HDI, when looking at a country's performance over the past two decades, we look at the percentage of the gap closed to a perfect score.

Here the difference between median values of resource-rich and resource-poor countries is starker, with resource-rich sub-Saharan Africa scoring −1.05 as compared to −0.56 for resource-poor countries. Neither group notched an average improvement over the past two decades, with a median decline of 1% relative to a perfect score for resource-rich countries and 2% for the resource-poor. As always, there is some heterogeneity: Botswana's score of 0.59 was the highest among resource-rich countries, and South Sudan's −2.13 was the lowest; Angola closed 19% of the gap to a perfect score over the past two decades, while Gabon reversed by the same amount. Mineral producers, nearly as a rule, either had scores competitive with the median score for resource-poor African or were trending in the right direction.

Table 5
Progress on the Human Development Index and Worldwide Governance Indicators among resource-rich countries in Sub-Saharan Africa, 1999–2019.

Country Name	Human development index, 2019	Percentage of HDI gap closed, 1999–2019	Average of Worldwide Governance Indicators (2019)	Percentage of WGI gap closed, 2000–2019
ongo, Rep.	0.57	20%	−1.23	0%
Equatorial Guinea	0.59	14%	−1.34	−1%
Angola	0.58	31%	−0.87	19%
South Sudan	0.43	4%	−2.13	−16%
Gabon	0.70	21%	−0.79	−20%
Chad	0.40	15%	−1.36	−11%
Nigeria	0.54	16%	−1.05	−2%
Mauritania	0.55	15%	−0.67	−13%
Sudan	0.51	19%	−1.52	0%
Zambia	0.58	28%	−0.45	0%
Guinea	0.48	22%	−0.87	7%
Congo, Dem. Rep.	0.48	20%	−1.61	7%
Botswana	0.74	37%	0.59	−7%
Average Resource-rich	*0.55*	*20%*	*−1.02*	*−3%*
Median Resource-rich	***0.55***	***20%***	***−1.05***	***−1%***
Average Resource-poor	*0.54*	*21%*	*−0.57*	*−2%*
Median Resource-poor	***0.53***	***22%***	***−0.56***	***−2%***

Source: Authors' calculations, data from UNDP (2021) and World Bank (2021c).

3.4. Diversification successes

To aggregate the findings from the previous three tables, we flag each country's performance on each indicator with a traffic light code based on their performance relative to resource-poor countries in Sub-Saharan Africa. To score green, the country should have a level of achievement equal to the median of resource-poor countries, as well as a rate of improvement at or better than the median among resource-poor countries. We are not overly strict in awarding a green rating: if a country is an over-performer on the level but merely competitive on the rate of improvement, for example, we still award a green rating. For a red rating, a country's level and/or rate of improvement must be well below that of the median resource-poor performance. Outcomes in between score yellow.

Table 6 reports the outcome of this rating exercise. Looking first at non-resource exports, Angola and Nigeria achieved a green rating in manufactured exports while Sudan and Zambia scored a green in service exports. When we look at food and agriculture exports per capita, Mauritania was the star performer, with a green score clearly outperforming resource-poor Africa, and the Republic of Congo also scoring green but barely clearing the bar. For economic complexity, just Botswana outperformed the median resource-poor country. Overall, based on export indicators, Botswana has held its own but failed to make significant relative progress; Republic of Congo, Angola, Nigeria, Mauritania, Sudan, and Zambia each have one sector with superior performance; yet no country has been able to use the resource boom to engineer a comprehensive diversification of its non-resource exports.

Next we look at broader measures of production and wealth creation, where the story is considerably improved. Seven of twelve resource-rich countries for which we have data outperformed the median resource-poor country in both levels and growth rates for manufacturing value added, with five of thirteen doing the same in service value added. Each of Nigeria, Zambia, and Botswana outperformed in both manufacturing and services, and the oil producers of Republic of Congo, Equatorial Guinea, Angola, and Gabon all scored a green for manufacturing value added and a yellow for services. In terms of the level and creation of non-extractive sector wealth, again Nigeria, Zambia, and Botswana outperform resource-poor Sub-Saharan Africa.

Is diversification success linked to success in raising overall human and institutional development? We do not attempt to formally answer this question with a quantitative technique but instead offer an exploration of the results.

Starting with human development, Botswana and Zambia, two of the diversification success stories, were also successful in outperforming in human development. Nigeria only managed a yellow score. On the opposite end of the diversification spectrum, Sudan, South Sudan, Chad, and DRC, also scored red on the HDI indicator. Countries with mixed scores including the Republic of Congo, Equatorial Guinea, and Mauritania predictably scored yellow on the HDI. Yet that still leaves three more "surprises." Angola and Gabon score a green in HDI despite a mixed diversification performance (likely driven by outperformance on GDP per capita), and Guinea scores yellow in HDI despite near-universal reds across the diversification measures.

Table 6
Evaluating diversification performance in resource-rich Sub-Saharan Africa, 1999–2019.

Source: Authors' calculations based on Tables 3–5

We turn now to institutional development. Our top diversifiers score green (Zambia), yellow (Botswana), and red (Nigeria), suggesting no clear correlation between diversification success and institutional development. Yet the worst and mixed diversifiers generally score red, with the exception again of Guinea, which scores yellow despite limited diversification. Angola, a mixed diversifier, also managed a yellow, driven (like Guinea) by its improvement rather than level of institutional development. Interestingly, Botswana and Zambia, the two top diversifiers in the sample, had the highest level of institutional and governance quality in 2019 but they did not have the greatest improvement in governance scores over the past two decades. This may imply that diversification does not bring about institutional improvement, but rather that institutions enable diversification.

4. Case studies

We now turn to the three most successful diversifiers: Botswana, Nigeria, and Zambia. The goal of these case studies is not to test a specific hypothesis, but rather to understand the types of improvements that they achieved and the political economy and policy details associated with these successes.

4.1. Botswana

Since Botswana's successful economy is one of the most studied in Africa, we only briefly cover the case. Instead, we point readers to the comprehensive accounts of Botswana's successes, including the roles of pre-colonial institutions (Acemoglu et al., 2012), management of foreign aid (Maipose, 2009), and macroeconomic policy (Sarraf and Jiwanji, 2001) in utilizing diamonds to generate economic growth and human development.

However, Botswana's success does not necessarily extend to economic diversification. Sekwati (2010) contends that Botswana has retained dependence on the diamond sector in spite of decades of well-funded economic policies that have explicitly targeted diversification. While Botswana's non-diamond sectors have performed well—which, according to this paper, is the essence of domestic economic diversification—Sekwati (2010) argues that the importance of diamonds remains high, and that some of the non-diamond economy is driven by public sector spending, which is financed by the diamond sector.

Botswana's concrete attempts to diversify include an effort at automobile manufacturing from 1993 to 2000, with a Hyundai assembly plant, predicated upon accessing the South Africa Customs Union tariff free; the plant ultimately closed because of a rules-of-origin challenge by South African manufacturers (Zizhou, 2009, 26–27). Two more successful and ongoing initiatives of diversification have driven the emergence of new export activities, including cutting and polishing of diamonds (Mbayi 2013) and tourism (Stone et al., 2017). These activities have the potential to generate good jobs and create successful businesses. While on the surface these activities in Botswana may not compare in their scope and success to world-leading jurisdictions in each industry, as this paper has shown they still represent a relative achievement and help to explain Botswana's continued progress towards diversification.

4.2. Nigeria

We next examine the case of Nigeria, whose relative success in diversification is in the domestic economy. In spite of this success, Nigeria's progress in human development has been sluggish and its mediocre governance institutions have worsened.

Nigeria's resource dependence is driven by a reliance on natural resources for export and government revenue as Table 2 reveals. With natural resources—almost exclusively petroleum—constituting an average of 87% of export earnings and 70% of government revenue, Nigeria is among the most resource-dependent countries in sub-Saharan Africa along these dimensions. In contrast, resource rents as a percentage of GDP, per capita rents, and subsoil per capita wealth are well below the average among the club of resource-rich countries in the region. In other words, oil provides the Nigerian economy with hard currency and Nigeria's government with tax revenue, but Nigeria is not extraordinarily resource abundant.

Besides petroleum and related products, Nigeria's resource exports are limited to small amounts of gold, tin, and a few other metals and minerals which in 2019 amounted to less than 1% of total exports (The Growth Lab at Harvard University 2021). Nigeria has a small service export including travel, tourism, and transport; a small agricultural export sector including cocoa, cashews, and leather; and limited exports of scrap metals and rigs. Looking over time, the composition of exports has not substantially changed since 1999, with almost total domination by the oil and gas sector. Services grow from a small base but remain relatively insignificant, some one percent of GDP in 2019. Similarly, agricultural exports also exhibit some improvement but fail to rise to a level of national consequence. Real oil exports are largely flat over this period, with natural gas increasing steadily to 11% of exports (BP, 2021, The Growth Lab at Harvard University 2021). Oil price fluctua-

tions, rather than quantity or non-oil exports, lead to volatile export values.

With gross exports representing just over a tenth of Nigeria's $450 billion economy (in 2019), and a population of over 200 million, the domestic economy seems to present the greater potential for economic diversification. To explore Nigeria's domestic economy in more depth we examine sectoral level value-added GDP data, accessed from Nigeria's National Bureau of Statistics. Constant dollar data from 2010 through 2019 Q3 are available on a quarterly basis, for the ISIC rev. 4 categories as described in Table 7 below. For each category, we describe the percentage of total GDP over the most recent four quarters, as well as the compound annual growth rate from 2010Q1 through 2019Q3.

As can be observed in the table, the natural resource sector (captured in mining and quarrying) makes up nearly a tenth of the economy but has been in decline. Also in decline are public administration (not surprising, given the link between oil and tax revenue) and finance and insurance. In contrast, agriculture, manufacturing, water, accommodation and food, education, and arts and entertainment are all growing faster than 6% per year, in real (but not per capita) terms. Just as important is Nigeria's success in diversifying non-resource wealth, as Table 4 depicts. A closer look at the data reveals that the lion's share of Nigeria's non-resource wealth comes from human capital, with even produced capital greater than the country's subsoil natural capital.

This recent progress comes following six decades of efforts to diversify the Nigerian economy, with mixed success. Nigeria has a history of coming up with development and industrialization plans and policies targeting economic diversification as an objective (Iwuagwu 2012; Iwuagwu, 2020).

In the 1960s following independence, Nigeria pursued an import substitution industrialization strategy, which saw the share of manufacturing to GDP rise from 4% in 1958 to 8.4% in 1967; while on the surface a success, it also was driven by imported inputs, a bias on consumer goods, and protection from foreign competition which "bred inefficiency and market distortions" (Iwuagwu 2012). In the 1970s, fueled by oil rents, industrial policy focused on indigenization—transferring ownership and control to Nigerians from foreigners—as well as inefficient large public sector investments, which again led to consumer-facing manufactures dependent on imported inputs (Chete et al., 2014).

Following the collapse of the oil price in the 1980s, which interacted poorly with Nigeria's dependence on imported inputs, Nigeria introduced a structural adjustment program that sought to harness market forces and deregulation to reduce dependence on imports and oil (Iwuagwu, 2020). While structural adjustment allowed freer exchange of hard currency, Nigerian industry faced greater import competition on finished products (Iwuagwu 2012). One consequence was the collapse of the textile sector, from a peak of 700,000 workers to 40,000 (Chete et al., 2014).

Following the shock of structural adjustment and the instability of various military governments, development strategy sought a "guided deregulation" of the economy, but in a manner that allowed the military leaders to "service their cronies" (Chete et al., 2014). Sometimes changed to reflect the priorities of individual leaders, policy statements focused on competitiveness, non-oil diversification, macroeconomic stability, support to manufacturing, and industrial policy around promising industries (Chete et al., 2014). We thus observe a consistent focus at the planning level in Nigeria on economic diversification, with policies largely aligning with the intellectual currents of the day.

Some commentators are sceptical of Nigeria's ability to deliver on policy documents in the absence of broader institutional development (Osabuohien et al., 2012); indeed, the government recognizes poor infrastructure including electricity, high cost of finance, policy inconsistency, limited government institutions that can drive industrialization, low skills and innovation, and inadequate standards (Nigeria Ministry of Industry, Trade, and Investment, 2014). Yet in the data we observe actual progress in the non-oil economy in general and manufacturing specifically, which by 2019 had reached 9% of GDP (Table 7).

Table 7
GDP Nigeria, value added, by sector, 2010-2019Q3.

GDP sector	Percent of total	CAGR (2010–19)
Agriculture, forestry and fishing	25.2%	7.8%
Mining and quarrying	8.9%	−0.7%
Manufacturing	9.1%	6.5%
Electricity, gas, steam and air conditioning supply	0.4%	4.3%
Water supply; sewerage, waste management and remediation	0.2%	10.3%
Construction	3.7%	3.4%
Wholesale and retail trade; repair of motor vehicles and motorcycles	16.1%	2.6%
Transportation and storage	1.5%	6.3%
Accommodation and food service activities	0.9%	10.1%
Information and communication	12.8%	3.9%
Financial and insurance activities	2.9%	−0.6%
Real estate activities	6.2%	2.7%
Professional, scientific and technical activities	3.6%	5.1%
Administrative and support service activities	0.0%	2.3%
Public administration and defense; compulsory social security	2.1%	−3.0%
Education	2.1%	6.8%
Human health and social work activities	0.7%	3.4%
Arts, entertainment and recreation	0.2%	16.8%
Other service activities	3.4%	5.6%

Source: Data from Nigeria National Bureau of Statistics (2021), compiled by authors

4.3. Zambia

We classify Zambia as a relative success, but like the case of Nigeria, Zambia's diversification performance has been mixed. Over the last two decades, copper exports have boomed, and in 2019 made up about 72 percent of all exports (The Growth Lab at Harvard University 2021). Among resource-rich African countries, Zambia has the third-best record in closing the HDI gap, and performed well in services exports. Its manufacturing exports rose modestly, while agricultural exports fell. Domestic diversification and non-resource wealth creation has been strong. However, rural poverty has remained extremely high. Among all the states on our list with data, Zambia's export complexity score fell the furthest.

Despite its green score in Table 6, Zambia has a mixed record on institutional quality. It has the second highest WGI score among the resource-rich countries, but it remained unchanged between 2000 and 2019. Freedom House rates Zambia as "partly free" (Freedom House, 2020). Its democratic institutions worked relatively well in the August 2021 national elections, in which incumbent President Edgar Lungu was defeated by a challenger, Hakainde Hichilema. Despite scattered violence and some initial criticism of the process, Lungu conceded the election and the subsequent transition was peaceful.

Zambia's economic fortunes have been closely tied to the copper industry for almost a century, producing alternating periods of boom and bust. After independence in 1964, Zambia's copper industry grew quickly but was criticized by the government for failing to share benefits with the indigenous population. Between 1969 and 1973, the copper sector was nationalized, in the hope it would help fund rapid growth in basic infrastructure, health, and education. Unfortunately, the government took ownership during the early years of a long period of falling copper prices; this caused the copper sector to become undercapitalized. The result was a 60% decline in copper production between 1973 and 2000 (Sikamo et al., 2016; Unceta, 2021).

By the mid-1990s, state ownership of the copper industry was widely seen as a failure. Between 1996 and 2000, the copper industry was re-privatized. To attract investors, the Zambian government offered excessively favorable terms: even though production and prices rose quickly after 2000, from 2000 to 2007 less than 1% of the government's revenue came from the mining sector. A series of reforms began to change this: between 2010 and 2020, the government's mining revenues made up between 25 and 35% of government revenues (Unceta, 2021). The rapid rise in copper prices from 2000 to 2011 also led to a booming economy, with GDP growth close to 10% in 2009 and 2010. In February 2011 global copper prices collapsed, causing a growth slowdown that has lasted until today.

This period of rapid export growth helps explain Zambia's large HDI gain: two-thirds of Zambia's HDI improvement since 2000 came in the first decade; after 2011, improvements continued but at about half the previous rate. It also explains why Zambia's economic complexity score plunged: as the volume of copper exports rose between 2000 and 2011, copper made up a growing fraction of total exports, leading mechanically to less export diversity. Zambia's ECI ranking dropped sharply from 2000 to 2007, but has been relatively flat since then.

Diversification efforts fall into two categories: initiatives within the mining sector (i.e., related diversification) and initiatives in the rest of the economy (unrelated diversification). In the mining sector, since 2006 the government has enacted a series of laws and policies meant to boost local content, but the results have been disappointing: a 2020 report from the Ministry of Mines stated that in 2019 the mining industry purchased just 2.1% of their goods and services from Zambian-owned firms. The poor design of the local content laws may help explain these results (Unceta, 2021). The government also tried to promote downstream minerals processing, and in 2008 established Multifacility Economic Zones. Again, the results have been unsatisfactory: while refined copper exports rose rapidly from 2008 to 2014, from 2014 to 2018 they fell sharply (The Growth Lab at Harvard University 2021).

Diversification efforts in agriculture and manufacturing have so far met with limited success. Between 2003 and 2018 Zambia exported just six new types of products whose collective value was $113 million, about one percent of total exports. The largest new export line was flavored waters, while the next three were refined metals products. Service sector exports, however, have been much stronger: from 1999 to 2019 they grew in value by 244 percent. In 2019, international tourists spent the equivalent of about ten percent of Zambia's total exports, and the tourism sector made up about seven percent of GDP and accounted for 7.2 percent of total employment (International Trade Administration, 2020).

5. Implications and conclusions

In this paper we have compared performance in economic diversification between 13 resource-dependent economies in Sub-Saharan Africa with their resource-poor counterparts. As a group, the resource-dependent countries underperformed across most dimensions of diversification, most dramatically when looking at measures of export diversification. When we focused on broader economic measures that are generally associated with diversification, the performance in resource-dependent countries was stronger, albeit still generally growing slower than in resource-poor economies. Botswana, Zambia, and Nigeria were the clear leaders in economic diversification among resource-rich countries, however even today remain dependent on their natural resource exports. A closer look at each country revealed decades of policies to promote diversification with only modest success.

Given the quantity of resource rents passing through these countries during the commodity supercycle of the beginning of the 21st century, the relative failure to utilize those rents to achieve diversification speaks to the challenges for resource-dependent Sub-Saharan African countries. We suggest two broad explanations for these broadly disappointing findings. First, economic diversification, especially export diversification, is intrinsically difficult for low-and-middle income resource-dependent countries, due to both Dutch Disease effects and the isolated product spaces of the oil, gas, and minerals sectors (Hidalgo and Hausmann, 2009). Export diversification occurs in the context of a global market, in which other countries have the benefit of doing related diversification, building on much more relevant capabilities. This makes it hard for resource-dependent countries in Sub-Saharan Africa to be broadly competitive even with the right capital and the best intentions.

Diversification of the domestic market shows more potential, however the unrelated diversification this path requires has more often been observed in markets with stronger market institutions and human capital (Boschma and Capone, 2015; Castaldi et al., 2015). A likely outcome of domestic diversification is that firms' techniques in navigating the business environment of a resource-rich country—how to deal with rent-seeking government, protectionist domestic markets, and low public service provision—will be the most relevant "related" capabilities around which private sector development occurs. This has the potential to create a false sense of business dynamism in the domestic economy, while perpetuating the political economy challenges that we next describe.

A second broad explanation for the poor diversification performance is that diversification in resource-dependent states is sensitive to the quality of institutions, which are necessary to negotiate with powerful foreign companies, collect and invest large revenue flows, restrain corruption, and sustain countercyclical policies (Mehlum et al., 2006). Yet building these institutions is slow and difficult work, and institutional quality can be impaired by large resource booms (Ross, 2001; Gill et al., 2014). In 1999, the institutional quality of Africa's resource-dependent countries was already below the regional average; from 1999 to 2019, institutional quality fell or remained unchanged in 10 of 13 countries. The two countries with institutions stronger than the median resource-poor country, Botswana and Zambia, were also the two top diversifiers in the resource-rich group. Emerging economies dependent on natural resources are often dominated by private sector interests that benefit from personalized rents rather than the broader market reforms that might enable diversification (Pritchett, Sen, and Werker, 2018a). As a result, commodity supercycles may strengthen those interests, preventing the emergence of competitive suppliers that are necessary for export diversification to occur and holding back further institutional development.

These two explanations point to the existence of a resource dependency "trap": countries that are dependent on natural resources seek diversification in order to fix the very problems that make diversification so hard to escape from, like Dutch disease, volatility, rent-seeking constituencies, and dynamic firms outside the resource sector.

Rather than simply pursue the elusive goal of diversification, policymakers in resource-rich countries in Africa may wish to consider a more modest agenda that takes into account the fundamental barriers to diversification. Such an agenda would have three primary components.

First, support efforts to create business in related activities, which typically means a "linkages" strategy of improving opportunities along the extractives value chain for domestic business. To the extent that linkage opportunities are kept separate from crony actors, businesses that supply globally-competitive multinational firms may learn new technologies and knowhow that can translate to further financial success (Alfaro, 2017), bringing about further economic diversification. However, this type of diversification is not sufficient. More domestic business activity on extractives supply chains leave the economy exposed to commodity price-induced volatility, and—in the case of oil and gas—exposed to the upcoming energy transformation.

Second, recognize the potential of domestic, nontradable sectors for unrelated diversification. This paper has found that resource-dependent countries did far better in diversifying their domestic economies than

their export sectors. The domestic economy can be developed in a way that is friendly to competition while growing existing industries and seeding new ones, unlike the ISI and indigenization policies of the 1960s and 1970s that created the pretense of domestic manufacturing but left economies reliant on imports, as the Nigeria case study reveals. While unrelated diversification can help solve the economic problems of resource dependence, the biggest challenge here is to prevent political capture by a private sector accustomed to carving out rents.

Third, set modest goals of single-digit growth in narrow export sectors. In this paper, we found that levels of per capita non-resource exports were in nearly all cases quite small, often well under $50 per capita across all of manufacturing, service, or food exports. Rather than imagine grand schemes of wholesale economic transformation, policymakers can pursue narrow sector development opportunities and aim for incremental progress. A handful of successes on such a micro level will, for many countries, result in relatively strong performance. Zambia and Botswana's tourism sectors exemplify this approach.

However, even this "second-best" agenda is not without political economy challenges for implementation. For instance, domestic elites have benefited from linkages opportunities in the extractive sector in at least a handful of countries in the region through "linkage patronage" (Buur, 2014; Hansen et al., 2016). Thus, any diversification policy must be grounded in political analysis (Whitfield and Buur, 2014).

To conclude, we make a call for further research. This paper has focused on descriptive results and broad case studies, relying on an interpretation of the data informed by sometimes peripherally-related research findings. Future research in this relatively understudied field can advance on these methods, challenge our associational findings, and test more precise hypotheses.

Three areas in particular may benefit from deeper research. One, insights and methods from the regional economics/economic geography literature on related and unrelated diversification could be applied to the question of low-income, resource-dependent economies. Two, better measures of non-resource domestic production across multiple countries are needed to separate true diversification from the simple refining of primary resources. Such data would enable richer and more accurate research on economic diversification of the domestic economy in resource-dependent countries. Three, consideration of non-resource activity as diversification brings about the inference challenge that such activity may be fueled through macroeconomic demand effects including increased borrowing.[5] Future research can help to tease out the historical role (and policy potential) of these demand effects on diversification.

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Author contributions statement

Michael Ross: Conceptualization; Data analysis; Methodology; Literature review; Historical research; Writing - original draft; Writing - review & Editing.

Eric Werker: Conceptualization; Data analysis; Methodology; Literature review; Historical research; Writing - original draft; Writing - review & Editing.

Uncited References

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[5] We thank an anonymous reviewer for pointing this out.

Declaration of competing interest

The authors affirm they have no conflicts of interest that pertain to the above mentioned research paper.

Data availability

Data will be made available on request.

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