Extractive Economies, Growth, and the Poor

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Abstract There is mixed evidence regarding the relationship between the extractive intensity of economic activity and the level of human development. Some studies find that mineral- and energy-intensive economies have higher levels of development than economies without a substantial extractive sector, whereas others find that they have lower development levels. Those that find the negative relationship commonly infer that there are ongoing, dynamic effects at work, such as an erosive effect of resource wealth on institutional quality, or a structural shift that reduces manufacturing employment and, with this, manufacturing's special development-enhancing impacts. These studies also infer that the lower development levels equate to negative impacts on the poor. Even in growing extractive economies, the poor are thought to be made worse off as a result of the extractive activities. None of these studies, however, specifically examines how growth spells in extractive economies affect the poor in those economies. This chapter examines this relationship via a simple comparison of a series of growth spells in extractive and non-extractive economies. It shows that the poor in growing extractive economies are as likely or more likely to benefit from that growth than are the poor in growing non-extractive economies. Thus, there is no evidence that positive growth in extractive economies is any worse for the poor than positive growth in non-extractive economies. What hurts the poor in any economy is negative growth, and resource extraction is bad for the poor only if it increases, for whatever reason, the frequency of negative growth in an economy.

1 The Resource Curse Conundrum

There is mixed evidence regarding the relationship between the intensity of non-renewable resource extraction in an economy and the level of human development

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in that economy.[1] Davis (1995) found that extractive economies as a whole have higher levels of development than economies without a substantial extractive sector, whereas others have found that extractive economies as a whole have lower levels of development (e.g., Bulte et al. 2005). None of these studies, however, directly examines how the boom–bust cycle of extractive activity affects the poor. Addressing the claims of the resource pessimists, this chapter compares the quality of a series of historical growth spells in extractive and non-extractive economies, with the goal of determining whether extractive economies experience a type of growth that is particularly bad for the poor.

A brief history of the debate over the development performance of the extractive economies provides context for this research. There are two general methods by which extractive economies have been evaluated: their *level* of human development, poverty, or per capita gross domestic product (GDP) relative to the level of that same indicator in a group of peer economies; and their *growth* in human development, poverty, or per capita GDP relative to growth of that same indicator in a group of peer economies. Via a series of case studies, geographer Richard Auty and economist Alan Gelb were among the first to raise modern concerns that there is a "Resource Curse",[2] whereby selected extractive economies appeared to suffer from inferior GDP growth as a result of their mineral and energy endowments (Gelb and Associates 1988; Auty 1993). The fear was that this inferior economic growth was leading to inferior levels of development, even to the extent that these economies were being made worse off as a result of their extractive activities. However, Davis (1995) investigated the level of development of the extractive developing economies as a group, and found them to have higher income levels and better human development indicators than non-extractive developing economies. The extractive economies also appeared to be pulling away from the other developing economies in terms of development performance over the 1970–1991 sample period.

Subsequent empirical studies of resource extraction and development performance have been equivocal. In a report for OXFAM America, UCLA political scientist Michael Ross found that extractive economies underperform in terms of broad human development indicators, and in several institutional and political metrics (Ross 2001). He also found that these countries had higher rates of poverty than their non-extractive peers. Though his data and statistical analysis have been challenged as being unreliable (Davis and Tilton 2002), a follow-up study in 2003 reiterated these findings (Ross 2003). Ross concluded in these studies that extractive activity

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[1]Economies with substantial non-renewable mineral and energy resource extraction activity will henceforth, in the interest of brevity, be referred to as extractive economies. Others use the term extractive economies to denote economies devoted to primary production inclusive of agricultural activities. That is not the intended use here.

[2]The "Resource Curse" is a term employed to represent below-par economic performance in extractive economies. The main implications of a Resource Curse are lower than expected real per capita economic growth and increased levels of poverty in these economies. See Davis (1995) and Davis and Tilton (2005) for an extended discussion of these issues.

is bad for the poor. A contemporaneous study of the 49 Least Developed Countries (LDCs) by the United Nations Conference on Trade and Development, asserted that dependence on mineral production was responsible for the large and rising levels of extreme poverty in mineral-exporting LDCs such as the Central African Republic, the Democratic Republic of the Congo (formerly Zaïre), Guinea, Liberia, Niger, Sierra Leone, and Zambia (UNCTAD 2002). The mechanism here was thought to be these countries' slower rates of export growth, and hence slower overall economic growth, due to armed conflict and rent seeking that distracts the government from undertaking appropriate macroeconomic planning. Bulte et al. (2005) also found that extractive economies tended to suffer from lower levels of human development relative to a set of non-extractive peer economies. The World Bank (McMahon and Remy 2001) and the International Council on Mining and Metals (ICMM 2006) have countered these findings by publishing a series of case studies outlining successful development progress in mining economies.

While all of this was going on, an influential and comprehensive set of econometric studies by Jeffrey Sachs and Andrew Warner determined that higher levels of resource extraction in 1970 were indeed associated with lower than expected subsequent rates of economic growth, confirming Auty and Gelb's earlier case-study work (Sachs and Warner 1995, 1997, 2001).[3] Stijns (2005), Ding and Field (2005), and Brunnschweiler and Bulte (2008a, b), on the other hand, found that under different measures of natural resource abundance, resource endowments have either no effect or a positive effect on economic growth. Exemplifying the resource measurement problem, Sala-i-Martin (1997a, b) found that the fraction of primary products in total exports, a measure of overall extractive and agricultural intensiveness, is negatively correlated with economic growth, whereas the fraction of GDP in mining and energy extraction, a measure of purely extractive activity, is positively correlated with economic growth. In a later paper Sala-i-Martin et al. (2004) again found that the fraction of GDP in mining and energy extraction is positively correlated with growth, but that the fraction of primary products in total exports is not correlated with growth. In this later paper Sala-i-Martin et al. (2004) used a slightly different statistical technique. To confuse matters even more, in an IMF interview (IMF 2004), Sala-i-Martin summarized the empirical evidence as showing that minerals and energy extraction *depress* growth, ignoring his repeated empirical findings that minerals and energy extraction are positively correlated with growth. Sala-i-Martin is not the only academic to ignore his own research findings; in a radio interview in 2003 (NPR 2003) Jeffrey Sachs suggested that Iraq needed to increase its oil output, failing to note the Sachs and Warner (1995, 1997, 2001) evidence that this will slow Iraq's long-term growth. Jeffrey Sachs' latest position is that while the evidence points to extractive economies having a slower rate of growth than they should be realizing given their vast resources, the oil-rich countries, at least, tend to

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[3] Actually, Sachs and Warner examined growth in labor productivity (growth in GPD per worker), which is closely related to what is commonly referred to as economic growth (growth in GDP per capita).

have higher life expectancies, lower child mortality rates, higher electricity use per capita, and more paved roads than oil-poor countries. "In many categories of well-being... oil producers are better off than their oil-poor counterparts" (Sachs 2007, p. 173).

Despite the state of confusion as to what the empirical evidence does or does not show, both with regard to the level of development and the rate of economic growth associated with extractive activity, the idea of a broad Resource Curse has become fixed in most people's minds. Extraction has been cast as a "loser" sector by political economists (see the discussion in Davis 1998), and oil is being blamed for poverty and unrest in the Middle East and North Africa (Surowiecki 2001). Ross (2001, p. 16) concluded that "Oil and mineral dependence produce a type of economic growth that offers few direct benefits to the poor; moreover, oil and mineral dependence make pro-poor forms of growth more difficult, due to the Dutch Disease."[4] The evidence is apparently so compelling that radical policy adjustments are suggested: "We believe the best course of action for poor states would be to avoid export-oriented extractive industries altogether, and instead work to sustainably develop their agricultural and manufacturing sector—sectors that tend to produce direct benefits for the poor, and more balanced forms of growth" (Ross 2001, p. 17). Others have joined the fray: (Christian Aid 2003, p. 4) asserted that "Oil has not only failed to bring benefits to the world's poor communities—it has been decisive in making them poorer." These and other statements had enough traction that the World Bank began questioning its promotion of mineral and energy projects as a path to poverty reduction, and initiated an external Extractive Industries Review in 2001 (World Bank 2003).[5] Along with a series of recommendations as to how the World Bank could better manage its extractive projects to reduce poverty, the Review suggested that it stop funding oil and coal mining projects. Michael Ross served on the Review Advisory Committee. The Bank subsequently decided not to follow this recommendation.

The latest assault on extractive activity, and in particular the multinational companies involved in extraction, is being made by Nobel Prize winner Joseph Stiglitz (2007). Stiglitz interprets the research as providing unequivocal evidence that extractive economies have higher rates of poverty due to their extractive activity.

If we are to truly understand whether extractive activity increases or decreases the level of poverty, the topic of interest to this chapter, two methodological adjustments need to be made. First, when investigating levels, there must be a distinction between the level of human development and the level of poverty. Ross (2001, 2003) and Bulte et al. (2005) used the United Nations' Human Development Index (HDI)

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[4]The Dutch Disease refers to the macroeconomic adjustments that occur in an open economy during a resource boom. These adjustments include an expanding extractive sector, shrinking manufacturing and agricultural sectors, and an appreciating exchange rate.

[5]The report can be found (as of July 23, 2008) at http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTOGMC/0,,contentMDK:20306686~menuPK336936~pagePK:148956~piPK:2l66l8~theSitePK:336930,00.html
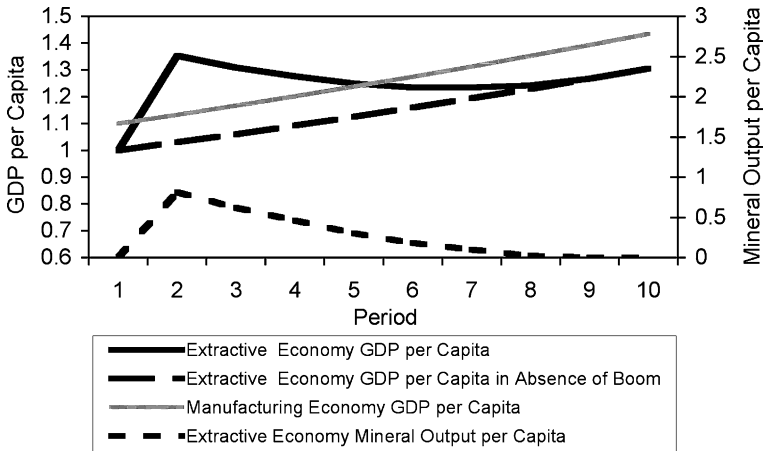
Fig. 1 Real GDP per capita (currency units per capita) and mineral output per capita (weight or volume units per capita) for a poor extractive economy, and real GDP per capita (currency units per capita) for a wealthy manufacturing economy, over 10 periods. The resource boom begins in period 2 and ends in period 9. The mineral output profile is a result of a dynamic optimization of a fixed stock of resources, based on a model by Boyce and Emery (2007)

and other human development indicators in their assessment of extractive economy performance. The HDI includes measures of longevity, educational attainment, and standard of living. Ross contended that the HDI and other development indicators provide an assessment of the condition of the poor. Human development indicators, however, are not a measure of poverty (UNDP 1997, pp. 22–23). This is why the United Nations created the Human Poverty Index (HPI) in 1997 for a group of 78 developing countries. In 1998, it created a parallel Human Poverty Index (HPI-2) for selected industrial countries, noting that there is "no pattern between the HDI and human poverty" (UNDP 1998, p. 29). Thus, whatever the relationships between mineral or oil dependence and development performance, it tells us little about the relationship between extractive activity and the welfare of the poor.

Second, when investigating trends rather than levels, which is what most of the research does, it is useful to separate out impacts of extractive activity on the rate of economic growth from its impacts on the poverty-reducing quality of that growth. Extractive economies typically go through a boom–bust cycle over the life of the extractive activity, wherein there is initially rapid economic growth as the resource begins to be exploited, followed by a drop off and even negative growth as the resource is exhausted (Sachs and Warner 1995; Rodriguez and Sachs 1999; Bravo-Ortega and de Gregorio 2007). To illustrate this, Fig. 1 presents a comparison of the growth paths of a stylized developed manufacturing economy, and a slightly less productive but otherwise identical developing economy that discovers resources and extracts them until the are exhausted. The graphic represents a macroeconomic model of an optimally managed extractive economy, with no rent seeking or other ill effects of the resource boom (Boyce and Emery 2007). Because of the mechanics
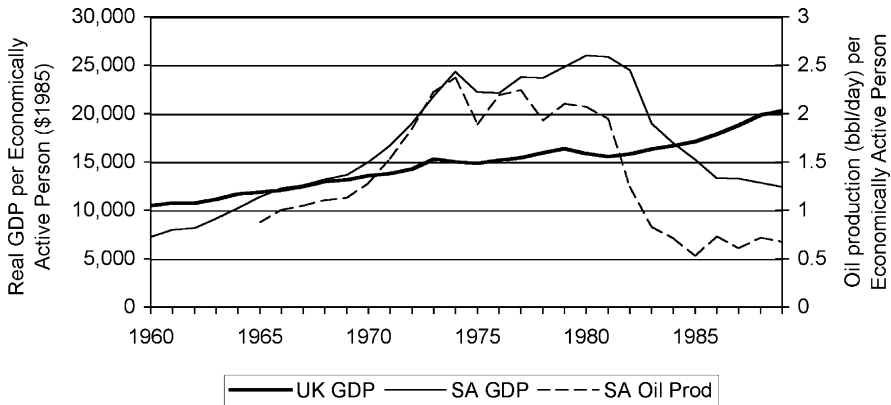
Fig. 2 Annual real GDP (1985 PPP dollars) per economically active person for Saudi Arabia (SA GDP) and the United Kingdom (UK GDP) from 1960 to 1989; daily oil production per economically active person for Saudi Arabia (SA Oil Prod) is shown from 1965 to 1989

of national income accounting, the boom–bust profile of GDP per capita follows the boom–bust profile of extractive output per capita. The extractive economy's real rate of growth during the resource boom is initially higher than that of the richer manufacturing economy, and then becomes negative as extractive output slows. Note that during part of the resource boom the extractive economy's level of income per capita is higher than that of the manufacturing economy.

Figure 2 depicts the actual oil boom–bust cycle in Saudi Arabia, a developing economy, from 1960 to 1989. Saudi Arabia's economic growth was at first positive as per capita oil output grew, and then turned negative after 1981 as per capita oil output fell precipitously. By comparison, the UK, a developed manufacturing economy, grew at a relatively constant rate. Interestingly, previous analyses of Saudi Arabia's faltering economic growth since the 1970s have looked to profligate government spending as the cause (Karl 1997; Stiglitz 2007), with no mention of the natural boom–bust cycle of oil production. That is, researchers have been viewing Fig. 2 without the benefit of seeing the oil output profile superimposed on the graphic.

It is widely accepted that positive growth is good for the poor, whereas negative growth is not (Dollar and Kraay 2002; Kraay 2006). Poverty should therefore decrease during the initial phase of the extractive boom, and then increase as extraction wanes and economic growth turns negative. UNCTAD (2002) showed that LDCs that were mineral economies saw increasing levels of poverty during the bust cycle from 1990–1999, while non-extractive economies saw decreasing levels of poverty as their economies grew. The decline in extractive output per capita depicted in Fig. 2 hit more than just Saudi Arabia in the 1980s (and 1990s)—the per capita extractive output of the other mineral- and energy-intensive economies also fell (Manzano and Rigobón 2007). Given the tight relationship between extractive output and GDP (Fig. 1), this would seem to indicate that the "problem" for

the poor in the extractive economies is not deleterious political and social outcomes of resource extraction, but rather the failure of extractive output to keep up with population growth.

Ross (2001, 2003), on the other hand, argued that the growth that occurs in extractive economies is not good for the poor, no matter whether that growth is positive or negative. This distinction between the pro-poor quality of growth and rate of growth in extractive economies is thus an important consideration when trying to understand the Resource Curse. Ross himself has named as a research priority studies that track the distribution of income over time in countries undergoing a mineral boom (Ross 2007, p. 251). Is it the case that poverty persists or worsens even in a growing extractive economy? Botswana, the only country ever to graduate from LDC status, is commonly presented as an example of where extraction-led growth has given rise to poverty reduction (e.g., Acemoglu et al. 2003), but this may be the exceptional case. In the next section, I begin an introductory foray into this type of analysis by comparing the quality of growth spells across a large set of developing and developed economies, both extractive and non-extractive, over a 43-year time period. My emphasis is not on human development, but on the poor, and on how growth in extractive economies may or may not be as beneficial to the poor as growth in non-extractive economies.

2 Measuring the Quality of Extractive-Economy Growth

This section analyzes the poverty-reducing quality of extractive-economy growth using World Bank data. These data track income growth by income quintile across 67 non-extractive economies and 21 extractive economies from 1956 to 1999.[6] The World Bank data are based on periodic individual or household surveys of income or consumption, collected at the national or subnational level. From these surveys economy-wide mean income level by income quintile is computed. Repeated sampling allows the change in mean income level to be tracked over time for each income quintile. Prior to computing these changes, the income data were converted to real international dollars using 1985 PPP (purchasing power parity) exchange rates.

Each intertemporal income comparison within an economy is called a growth spell. There are 240 growth spells in the sample. Some economies in the sample have multiple recorded growth spells, whereas others only have one. Because of the

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[6]The 21 extractive economies in the sample, based on the ratio of mineral exports to GDP in 1995 (Ross 2001), are Sierra Leone (1968–1989), Zambia (1959–1996), Mauritania (1988–1993), Niger (1960–1992), Chile (1968–1992), Jordan (1980–1997), Bolivia (1968–1990), Peru (1961–1994), Ghana (1987–1997), Bulgaria (1984–1989), Norway (1962–1989), Australia (1967–1986), Yemen (1992–1998), Nigeria (1959–1997), Gabon (1960–1995), Algeria (1988–1995), Venezuela (1962–1993), Ecuador (1968–1994), Malaysia (1970–1995), Indonesia (1976–1999), and Cote d'Ivoire (1985–1993). The period over which each country's growth spells were measured is given in parentheses.

irregular spacing of the income surveys for each country, the growth spells range from 5 to 37 years, and average 7 years. The earliest growth spell starts in 1956 and the latest ends in 1999, which is the period over which most of the extraction-based economies rapidly expanded their extractive activity, providing a relevant set of data for the analysis at hand.

Economic growth can have two effects on the poor: an income level effect, and an income distribution effect. In measuring income level effects, it is often necessary to first define the poverty level (e.g., $0.50/day, $1.00/day, $2.00/day, etc.), and then to define how the quantity of poverty is measured with respect to that level (Watt's index, headcount, poverty gap, squared poverty gap, etc.). Different poverty levels and poverty measures lead to different results, commonly creating ambiguity as to whether poverty has risen or fallen as a result of a growth spell. To make this analysis as robust as possible, I have adopted the requirement that a growth spell be deemed good for the poor only if poverty is measured to drop regardless of the poverty measure used (Watt's index, headcount, poverty gap, squared poverty gap, etc.), and regardless of where the poverty line is drawn ($0.50/day, $1.00/day, $2.00/day, etc.); the improvement in poverty must be unambiguous.

Poverty is also reflected in non-monetary ways, such as health, which may depend on relative rather than absolute income levels (Deaton 2003). This is the income distribution effect. The "Kakwani" definition of pro-poor growth takes this second facet of poverty measurement into account, requiring that a *pro-poor* growth event reduce income poverty (an *anti-poverty* effect) and income inequality (an *anti-inequality* effect) at the same time (Kraay 2006). Along the same lines, I define "unambiguous pro-poor growth" as growth, be it positive or negative, that reduces income poverty no matter how income poverty is measured (i.e., the growth is unambiguously anti-poverty), while at the same time reducing income inequality across the entire population (i.e., the growth is also unambiguously anti-inequality). Requiring that the growth event be unambiguously pro-poor avoids the criticism that the results are conditional on the poverty measure or cut-off used, or that they ignore income distribution effects.

Not all growth is unambiguously pro-poor: it can worsen income inequality across the entire population, which is *pro-inequality* growth; it can unambiguously increase poverty, which is *pro-poverty* growth; or it can have an ambiguous effect on income and inequality, where the categorization would depend on the poverty measure and poverty level used. The labels for the types of growth spells are given in Table 1. *Pro-poor positive growth* and *pro-poor negative growth* are the unambiguously desirable types of growth (from the perspective of the poor), whereas *immiserizing positive growth* (positive growth that results in the poor being made unambiguously worse off) and *not pro-poor negative growth* (negative growth that results in the poor being made unambiguously worse off) are the undesirable types of growth. The other categorizations (not pro-poor positive growth, inconclusive positive growth, or inconclusive negative growth) can have both positive and negative effects on the poor, and are therefore not of interest here because they do not help us to resolve unambiguously the quality of an extractive economy growth spell.

Table 1   Qualities of economic growth under positive and negative growth spells

Positive growth spell quality	
Pro-poor	Income of the poor unambiguously increases, inequality unambiguously decreases
Not pro-poor	Income of the poor unambiguously increases, inequality unambiguously increases
Immiserizing	Income of the poor unambiguously decreases, inequality unambiguously increases
Inconclusive	Categorization depends on chosen poverty level
Negative growth spell quality	
Pro-poor	Income of the poor unambiguously increases, inequality unambiguously decreases
Not pro-poor[a]	Income of the poor unambiguously decreases, inequality unambiguously increases
Inconclusive	Income of the poor unambiguously decreases and inequality unambiguously decreases, or categorization depends on chosen poverty level

[a]Equivalent to immiserizing in the positive growth spell case.

Ross's (2001, 2003) charge, perhaps the most pointed of those who decry extraction-based development, is that extractive economies suffer from a type of growth that is bad for the poor. Certainly, if extractive economies enjoy fewer positive growth spells as a result of the Resource Curse, there will likely be fewer pro-poor growth events. But the question at hand is rather: are the growth spells that extractive economies experience, be they positive or negative, any worse for the poor than those experienced by non-extractive economies? Or, using my growth spell terminology, are there relatively fewer cases of unambiguously pro-poor positive growth, and relatively more cases of unambiguously immiserizing positive growth, in the extractive economies? There are certainly reasons to think that this may be the case. Mineral and energy booms have been thought to crowd out jobs for unskilled or semi-skilled workers (Ross 2003, p. 7), to reduce manufacturing jobs that favor women or older workers (Ross 2007) and result in less income inequality (Leamer et al. 1999), and to reduce agricultural sector jobs, a sector that is suggested to have special importance in reducing income poverty in a growing economy (Ross 2003, p. 8, 2007; World Bank 2008).

On the other hand, extractive activity decreases unemployment and provides economic stimuli in rural areas (Wallace 1999; McMahon and Remy 2001). Evidence from Cote d'Ivoire shows that rural incomes increase with decreased distance to paved roads and public markets (Klugman 2002, p. 45). This is infrastructure that is associated with extractive activity. Extractive sector booms may also lead to new government jobs through mineral and energy revenues. There is some evidence that countries with a larger government labor force have lower income inequality (Ross 2007). Income diversification within traditionally agricultural households has also been found to be important for avoiding the poverty trap (Ellis and Allison 2004), and the rural nature of mining would facilitate this, either directly or through

remittances. If there is enough extractive activity within an economy, these local effects are likely to compound to such an extent that they can be measured as pro-poor growth at the national level.

2.1 Empirical Results

Table 2 tabulates the quality of the 240 growth spells in the data sample according to type of economy—extractive or non-extractive—as defined by (Ross 2001). Although I do not necessarily agree with Ross's typology, I use it because it was through this typology that he determined that extractive-economy growth was bad for the poor. The tabulations are based on an analysis of each growth spell using Son's "poverty growth curve" method (Son 2004). To implement this method, the World Bank income data are converted into a poverty growth curve, which represents rate of growth of mean income by ascending cumulative income quintile, $g(p)$. For example, $g(20)$ represents the rate of growth of the mean income of the poorest 20% of the population in an economy, $g(40)$ represents the rate of growth of the mean income of the poorest 40% of the population, and so on. Economy-wide income growth, which is what national income accounts measure and which is often referred to as growth in GDP per capita, is represented by $g(100)$. The patterns in the growth in income across the various income quintiles allow each growth spell to be tabulated according to the categories listed in Table 1.[7]

The extractive economy cohort contains 48 growth spells, 35 with positive growth and 13 with negative growth, whereas 192 growth spells were analyzed for non-extractive economies, 162 with positive growth and 30 with negative growth. These spells therefore represent both booms and busts in both types of economy.

Focusing on the positive growth spells, 46% (16 of 35) of these events in the extractive economies were unambiguously pro-poor, whereas only 37% (60 of 162) were unambiguously pro-poor in the non-extractive economies. Positive growth spells in the extractive economies therefore appear to be more likely to be unambiguously pro-poor than the positive growth spells in the non-extractive economies. The chance that a positive growth spell is unambiguously immiserizing is the same in both types of economy, at roughly 5%. The other growth spells cannot be conclusively categorized as good or bad for the poor.

Based on these data there is no evidence that positive growth in an extractive economy, when it happens, tends to be bad for the poor. As with findings in previous research, growth is generally good for the poor, and there is no evidence that it is less frequently good for the poor in extractive economies than in non-extractive economies.

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[7]For more on this growth spell categorization method, see (Son 2004) and (Davis 2007). Davis provides graphical depictions of three sample poverty growth curves. I would like to thank Hyun Son for providing me with her poverty growth curve data.

Table 2 The pro-poorness of economic growth in extractive and non-extractive economies

	Positive growth spells		Negative growth spells		Total
	Count (%)		Count (%)		
	Extractive economies	Non-extractive economies	Extractive economies	Non-extractive economies	
Pro-poor	16 (46)	60 (37)	0 (0)	3 (10)	79
Not pro-poor	5 (14)	33 (20)	n/a	n/a	38
Immiserizing[a]	2 (6)	6 (4)	7 (54)	16 (53)	31
Inconclusive	12 (33)	63 (39)	6 (46)	11 (37)	92
Total	35 (100)	162 (100)	13 (100)	30 (100)	240

[a]Defined as "not pro-poor" in the case of negative growth, because "immiserizing" growth is a term traditionally restricted to positive growth spells.

Table 3 Summary of growth and poverty in extractive and non-extractive economies

	Positive growth spells		Negative growth spells		Total
	Count (%)		Count (%)		
	Extractive economies	Non-extractive economies	Extractive economies	Non-extractive economies	
Anti-poverty	27 (77)	126 (78)	0 (0)	3 (10)	156
Pro-poverty	2 (6)	6 (4)	12 (92)	25 (83)	45
Inconclusive	6 (17)	30 (19)	1 (8)	2 (7)	39
Total	35 (100)	162 (100)	13 (100)	30 (100)	240

What of the negative growth spells? Are these worse for the poor in extractive economies than for the poor in non-extractive economies? Though the sample set is small, the negative growth spells suffered by the extractive economies are unambiguously not pro-poor 54% of the time, about the same frequency as for the non-extractive economies (53%; Table 2). Thus, as expected intuitively, negative growth is rarely pro-poor in either type of economy.

This finding of a higher frequency of positive growth spells that are pro-poor in extractive economies than in non-extractive economies has focused on a measure that combines poverty and income inequality effects. However, it is also useful to look separately at poverty and income inequality (Tables 3 and 4). Kraay (2006), who included a number of extractive economies in his growth spell sample, found that there were no cross-country differences in the impact of growth on the level of income poverty. In this study, the conclusion is similar when comparing the frequency of unambiguous poverty improvements in extractive and non-extractive economies. Positive growth spells were unambiguously anti-poverty in 77% of the episodes in extractive economies, and in 78% of the episodes in non-extractive economies (Table 3). Some 6% of the positive growth spells were unambiguously pro-poverty in the extractive economies, compared with 4% in the non-extractive

Table 4 Summary of growth and inequality in extractive and non-extractive economies

	Positive growth spells		Negative growth spells		Total
	Count (%)		Count (%)		
	Extractive economies	Non-extractive economies	Extractive economies	Non-extractive economies	
Anti-inequality	16 (46)	60 (37)	3 (23)	8 (27)	87
Pro-inequality	9 (26)	59 (36)	7 (54)	16 (53)	91
Inconclusive	10 (29)	43 (27)	3 (23)	6 (20)	62
Total	35 (100)	162 (100)	13 (100)	30 (100)	240

economies. In a sample that is probably too small to have much reliability, negative growth spells were unambiguously pro-poverty in 92% of the cases for extractive economies, and in 83% of the cases for non-extractive economies. The other results are inconclusive, meaning that whether or not the growth spell was good for the poor would depend on the poverty measure used and the income level by which poverty is defined.

The other aspect of growth spells is the concomitant change in relative income, or income inequality, within a country. Kraay (2006) found that different countries have different relative income effects associated with growth spells, and that there is no evident explanation as to why growth spells in different countries have these different relative income effects. According to my data, positive growth spells in the extractive economies have an increased tendency to be unambiguously anti-inequality (46% of cases) than in non-extractive economies (37% of cases; Table 4).[8] They are unambiguously pro-inequality in 26% of the cases, whereas non-extractive economy positive growth spells are unambiguously pro-inequality in 36% of the cases. There is parity between the extractive economies and non-extractive economies in the negative growth spells, though the sample is too small to carry much weight. The other results are inconclusive, meaning that income inequality is not reduced or increased across the entire population profile, a requirement for the growth spell to be classified as unambiguously anti-inequality or pro-inequality.

The conclusion from this empirical analysis is that when extractive economies experience positive growth, there is no prima facie evidence that the growth is any worse in its impact on the poor than growth in non-extractive economies. If anything, positive growth in an extractive economy appears to have a greater chance of being pro-poor than positive growth in a non-extractive economy, due to the former's favorable impacts on income distribution. This finding is especially signifi-

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[8]All anti-inequality positive growth spells were also anti-poverty growth spells, and hence the number of anti-inequality positive growth spells in Table 4 matches the number of pro-poor growth spells in Table 2.

Table 5 Simple correlation between rate of growth in a growth spell and the quality of that growth spell

Growth spell quality	All growth spells	Positive growth spells	Negative growth spells
Pro-poor	0.22 ($n = 79$)	0.00 ($n = 76$)	0.27 ($n = 3$)
Immiserizing[a]	−0.55 ($n = 31$)	−0.21 ($n = 8$)	−0.31 ($n = 23$)

[a] "Not pro-poor" in the case of negative growth.

cant given that the growth spells in the dataset are measured over the period when many of the 21 extractive economies in the sample were intensifying their extractive activity, and given the frequent claims that extraction-based growth leads to worsening income distribution (e.g. Stiglitz 2007).

In the light of the evidence that extractive economies may suffer from a decreased or even negative rate of growth (the Resource Curse), I now look at whether the level of growth within a positive or negative growth spell makes a difference. Is slower positive growth worse for the poor than faster positive growth? Is more negative growth worse for the poor than less negative growth? Table 5 reports the results of a calculation of the simple correlations between the rate of growth in a growth spell, measured on a continuous absolute scale, and growth spell quality across the 240 growth spells in the sample. In performing this calculation, growth spell quality is identified as the binary 1,0 (pro-poor, other) when categorizing pro-poor growth spells, and the binary 1,0 (immiserizing, other) when categorizing immiserizing growth spells. In the first column we see that, amongst all growth spells, the higher the rate of growth the higher the probability of that growth spell being unambiguously pro-poor and the lower the probability that the spell is unambiguously immiserizing. However, when the sample is divided into separate positive and negative growth spell cohorts, the correlation coefficient values indicate that a higher rate of positive growth amongst the positive growth cohort reduces the probability of that growth spell being unambiguously immiserizing, but it has no effect on the chance that the growth spell will be unambiguously pro-poor. The latter effect comes about because of inequality effects, where very high rates of positive growth do not necessarily reduce income inequality, which is half of the pro-poor criterion. Higher growth rates amongst the negative growth cohort (negative growth rates that are closer to zero) are better for the poor in that they increase the probability of the growth event being unambiguously pro-poor and decrease the chance that it is unambiguously not pro-poor.

Summarizing these findings, faster positive growth is beneficial in its reduced chance that the growth is unambiguously bad for the poor, and a lower absolute rate of negative growth is beneficial in its improved chance that it will be unambiguously good for the poor and its reduced chance that it will be unambiguously bad for the poor.

As shown in Tables 2, 3, and 4, a negative growth spell has a lower probability of being unambiguously anti-poverty, anti-inequality, or, combining the two, pro-poor, than a positive growth spell. It also has a higher probability of being unambiguously

pro-poverty, pro-inequality, or, combining the two, not pro-poor. Given the low frequency of immiserizing positive growth, the main implication from this analysis is that positive growth is good for the poor, even in extractive economies. The most important way to avoid bad growth outcomes for the poor in extractive economies is to avoid negative growth, or at least have a low absolute rate of negative growth.

2.2 Development in Indonesia, Nigeria, and Zambia

This section uses the growth spell categorization methods of this chapter to assess the often contrasted development experiences of Indonesia, Nigeria, and Zambia, three extractive economies. Table 6 lists the measured growth spells and growth spell qualities for these countries. Indonesia is an economy that has been heralded as escaping the Resource Curse through effective government policy aimed at pro-poor initiatives (Bevan et al.1999; Ross 2007). In this analysis all of Indonesia's four measured growth spells between 1976 and 1999 were unambiguously anti-poverty, and two were also unambiguously anti-inequality (making them unambiguously pro-poor overall). Perhaps these favorable outcomes are a result of exceptional development programming. Yet in the light of the preceding analysis it cannot be ignored that all four of these growth spells were positive, some with very high rates of economic growth.

On the other hand, Nigeria, which is often mentioned as epitomizing the Resource Curse (Ross 2007), had three measured growth spells from 1959 to 1997. The first growth spell, measured over a 26 year period, was positive, and was unambiguously anti-poverty: real incomes increased across the entire income distribution. The next two growth spells, each lasting 6 years, were negative, and both were unambiguously pro-poverty. The first of these spells was also unambiguously pro-inequality, making it unambiguously not pro-poor overall.

Zambia, similarly, had a 17 year positive growth spell, with no unambiguously negative impacts on the poor, followed by a 15 year negative growth spell, then another 5 year negative growth spell. The first negative growth spell was unambiguously pro-poverty but unambiguously anti-inequality (poverty worsened but income inequality improved), whereas the second was unambiguously not pro-poor (poverty worsened and income inequality worsened). Clearly, the comparative fate of the poor in these three economies is strongly conditioned on whether the economy was experiencing positive or negative growth. Positive growth is beneficial to the poor and negative growth is harmful to the poor, no matter what the structure of the economy.

Finally, it is of interest to dig a little deeper into what might have caused the varying growth performance of these three economies. Traditional Resource Curse proponents argue that extractive economies have slower or negative growth due to poor macroeconomic management. As Figs. 1 and 2 show, however, the boom–bust nature of extraction also plays a large part in a country's growth profile. Figure 3 maps the growth spells presented in Table 6 onto a graph of the annual mineral

Table 6 Quality of growth spells for Indonesia, Nigeria, and Zambia

| Country	Income or consumption survey year	Growth spell index	Annual growth in mean income level, 1985 PPP dollars, by cumulative income percentile					Length of growth spell in years; positive (+) or negative (−) growth	Quality of growth spell
			g(20)	g(40)	g(60)	g(80)	g(100)		
Indonesia	1976								
	1981	A	7.57	9.17	8.56	8.42	8.29	5(+)	Anti-poverty
	1987	B	2.91	2.69	2.55	2.47	2.34	6(+)	Pro-poor
	1993	C	5.77	4.46	4.72	4.67	4.39	6(+)	Pro-poor
	1999	D	1.12	1.01	0.81	0.55	0.59	6(+)	Anti-poverty
Nigeria	1959								
	1985	E	1.64	2.84	3.49	3.53	2.22	26(+)	Anti-poverty
	1991	F	−7.16	−4.38	−2.97	−1.7	−0.35	6(−)	Not pro-poor
	1997	G	−0.05	−1.99	−2.94	−3.73	−1.49	6(−)	Pro-poverty
Zambia	1959								
	1976	H	−1.77	−0.70	0.52	1.43	1.36	17(+)	Inconclusive
	1991	I	−0.73	−1.44	−1.96	−2.47	−3.46	15(−)	Pro-poverty, anti-inequality
	1996	J	−7.35	−5.71	−4.73	−3.79	−1.7	5(−)	Not pro-poor
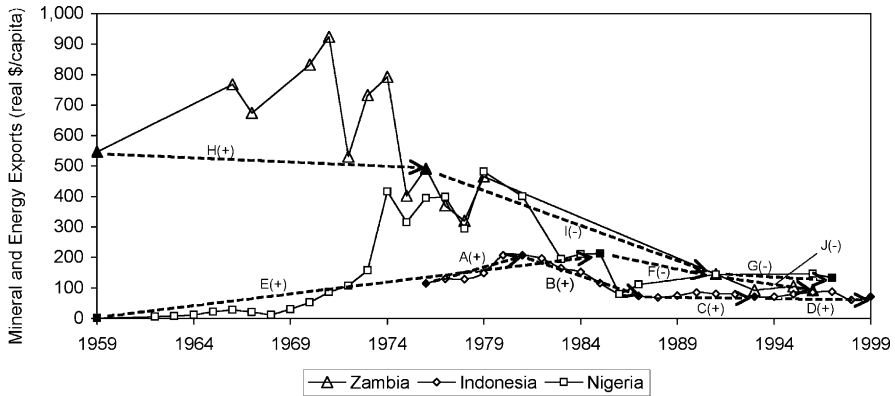
Fig. 3 Annual mineral and energy exports for Indonesia, Nigeria, and Zambia, 1959–1999, in real $US/capita (2000). Data are not available for some years and are interpolated in these years. The corresponding growth spells from Table 6 are outlined in heavy dashed lines and indexed by letters, with the sign in the brackets following the letter indicating whether the growth spell was positive or negative

and energy exports per capita, measured in real US dollars, in each of these three countries. Mineral and energy exports are used as a proxy for domestic production. This period of analysis shows Nigeria's oil boom–bust and Zambia's copper bust. Indonesia's per capita mineral and energy exports were relatively small and stable by comparison.

Indonesia enjoyed its first growth spell (A) on the back of a mild minerals and energy boom. Indonesia's other three spells (B, C, and D) saw mineral and energy exports decline and economic growth slow, yet in each spell economic growth was positive and either anti-poverty or pro-poor. Nigeria initially embarked on a similar positive growth path on the back of increasing oil exports (E), with resultant unambiguous reductions in poverty. But negative growth ensued in the next two growth spells (F and G) as per capita oil exports declined. As noted above, that negative growth was unambiguously unfavorable to the poor. Zambia had a massive per capita copper production collapse after great promise in the early 1960s (Baldwin 1966), with a 20 year period of negative economic growth (growth spells I and J) that was for the first 15 years pro-poverty, and for the last 5 years both pro-poverty and pro-inequality (not pro-poor).

In sum, the differences in development experience across these three extractive economies, as measured by the quality of their growth spells (Table 6), may reflect differing domestic policies or institutional quality aimed at improving the welfare of the poor. It is more likely that the different experiences of the poor across these three countries arise from Indonesia's sustained positive economic growth versus Nigeria's and Zambia's negative economic growth. In the case of Zambia and Nigeria it can be argued that the negative growth spells were a result of the declining per capita resource production and exports. What would Zambia's state of development be if it had not had a 30 year mineral bust? Nigeria's oil boom is credited

for derailing a Nigerian economy that was previously growing well, the oil revenues helping to fund massively inefficient public investment projects and allowing unsustainable borrowing against future oil revenues (Bevan et al. 1999). Perhaps the seeds of Nigeria's collapse were indeed sown long before 1979. Even so, this research leaves little doubt that Nigeria's poor would now be better off if per capita oil exports had increased enough from 1979 onwards to create sustained positive economic growth.

3 Explaining Development Optimism and Pessimism for the Extractive Economies

With the proposition that extractive economies follow a boom–bust extraction cycle, and that economic growth will also follow that cycle (Figs. 1 and 2), previous contradictory analyses of the development performance of extractive economies can now be seen in a new light. Davis (1995), for example, measured extractive activity as being relatively good for development, whereas Ross (2003) and Bulte et al. (2005) measured it as being relatively bad for development. All came to their conclusions by looking at essentially the same data over the same time period, and all interpreted resource intensiveness in essentially the same way. In fact, the results are not inconsistent. The differences in development experience come from the fact that Ross (2003) and Bulte et al. (2005) assessed an economy's development performance over time conditional on the initial level of income per capita, and in comparison to the performance expected of economies at that level of income. By doing this they created a peer group for comparison according to initial income per capita. Because extractive economies are initially booming economies, with high levels of GDP per capita as the extractive activities ramp up, the peer groups for the developing extractive economies in these analyses included many developed economies.[9] Davis's (1995) peer group for developing extractive economies, on the other hand, was other developing economies.

To understand the impact of this conditioning on the analysis, consider three stereotypical economies in a sample set, AG (an agricultural economy), MAN (a manufacturing economy), and MIN (a mining economy). AG is a poor developing economy that has a sustained low level of income per capita, poor initial development indicators, and is trundling along as an LDC over the period of analysis. In an analysis conditioned on initial income per capita, AG would be found to be performing at the same level as other LDCs (its income per capita peer group), and no red flags would be raised. MAN is a developed economy with a high initial level of income, good initial development indicators, and a stable level of real growth. In an analysis conditioned on initial income per capita, MAN is also performing at

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[9]Bulte et al. (2005) also controlled for the relative price of investment goods in an economy, and so, strictly speaking, they are forming a peer group in both measures. Income per capita turns out to be the more important variable to control for, so I emphasize it here.

the same level as its peer group (other manufacturing economies), and again no red flags are raised. MIN is a booming extractive economy at the start of the analysis period, with newly found oil or mineral wealth. It was in the AG peer group prior to its resource boom, but is now at an income level such that in an analysis conditioned on initial income it is being compared against MAN economies, even though it is still classified as a developing economy. Its subsequent growth is likely to be slower than MAN due to the unsustainability of its resource boom, and its development indicators are inferior to those in its peer group (developed MAN economies). A statistical analysis, however, shows that MIN differs from its peers only in terms of extractive activity. Hence, MIN is deemed to be underperforming, and the reason for that underperformance is extractive activity.

Figure 2 illustrates how Saudi Arabia would be found to be underperforming via this method of analysis. Note Saudi Arabia's ascent by 1970 into the developed economy peer group, matching the GDP per capita of the UK, on the back of increasing oil production. In Bulte et al.'s (2005) analysis, the UK is one of Saudi-Arabia's peer countries based on their similar PPP GDP per capita levels in 1970 (1970 being the date of peer group formation in these studies).[10] The development performance measurement is taken 21 years later. Saudi Arabia, with its 2001 HDI value of 0.769, was measured by Bulte et al. (2005) to be under-performing relative to the UK, which had a 2001 HDI value of 0.930. They ascribed the relatively poor development performance of extractive economies such as Saudi Arabia to weaker institutions compared to their peer group of developed economies, and blamed the weaker institutions on oil. This is no doubt correct, but unfair. A booming extractive economy's income per capita level is suddenly and artificially inflated by its extractive activity (Figs. 1 and 2). An exercise that then compares the booming economy's institutional capabilities and development levels during the boom (or even two decades later) with those of a nation like the UK, by design sets up the extractive economy to fail.

Other examples include: (1) Peru, which was found to underperform relative to Portugal, Peru's income peer in 1970 due to its booming economy. In this case, mining was blamed (Portugal had little extractive activity in 1970); (2) Iran, which under-performs relative to Japan; (3) Chile, which under-performs relative to Singapore; and so on. Botswana, on the other hand, were it included in the sample, would out-perform its 1970 income peer, Zambia, and would be deemed to do so because of its absence of extractive activity in 1970 compared with Zambia![11]

In another study that uses peer group formation conditioned on initial income, Ross (2001) compared development performance in 1998 across countries with similar incomes per capita in 1998. In this analysis, Kuwait's development performance was inferior to Canada's, Canada being Kuwait's peer because the two had the same

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[10]Ross (2003) does not provide the list of countries in his data sample, and so I confine my comments in this and the next paragraph to Bulte et al.'s (2005) paper, which does list the countries in the sample.

[11]In 1970, Botswana had a primary production level roughly equivalent to that of Egypt.

1998 PPP GDP/capita; the United Arab Emirates under-performs compared to New Zealand; Botswana, now classified as a mineral economy because of its booming extractive sector, under-performs compared to Costa Rica; and so on.[12] Once again, extractive activity is identified as the common characteristic of the under-performing group. This method of analysis and the conclusions derived from it are clearly problematic.[13]

Davis (1995), on the other hand, selected developing countries such as AG as the peer group for MIN when assessing MIN's development performance. Because of the extractive boom, MIN outperforms AG both in terms of income per capita and development indicators. Saudi Arabia would be compared to developing countries as a whole, with its 2001 HDI value of 0.769 being superior to the developing country average of 0.655 (UNDP 2003).

So the development performance of the extractive economies depends on what one wishes to measure: development performance conditioned on a booming and unsustainable income level, or development performance conditioned on initial development status. The former naturally disposes the extractive economies to negative evaluations, because their booming levels of initial income per capita cause them to be compared to developed nations.

By comparison, the method used in this research does not condition growth quality by income level *or* by development status. It simply looks at the growth quality of 21 extractive economies as a group versus 67 non-extractive economies as a group.

4 Implications for Sustainability

This analysis of 240 growth spells across 88 countries from 1956 to 1999 finds little evidence to support the assertion that extractive economies experience a type of growth that is bad for the poor. According to the growth spell assessment method used here, positive growth tends to be better for the poor than negative growth, and there is nothing to indicate that this tendency is muted in extractive economies. By extension, if natural resource development is the only means a country has to create growth, then it is better doing that than not doing it. One of the strongest messages from the analysis presented in this chapter is that *negative growth is bad for the poor, and any economy, extractive or non-extractive, is likely to have an unsatisfactory trend in poverty levels if it has an extended period of negative*

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[12]While Ross does not list the countries used in his 2001 study, he was kind enough to send me his raw data file.

[13]Ross (2001) performed a few unconditional analyses of extractive activity and development performance, and found that once conditioning on income is removed, oil dependence is not related to lower human development performance. Mineral dependence is still related to lower human development performance. A troubling feature of this and most other analyses is that they do not control for other initial differences between economies, such as differences in institutional capabilities. Those that do control for initial institutional capability find that there is no negative development effect of being an extractive economy (e.g., Acemoglu et al. 2001).

growth. Zambia and Nigeria are examples, as is Saudi Arabia after 1981 (see Fig. 2). Indonesia and Botswana are counter examples, with extended periods of positive growth and consequently pro-poor outcomes.

To the extent that sustained or increasing per capita resource extraction increases the chances of positive growth, and because positive growth is good for the poor, pro-growth policy in extractive economies should not only be directed at rectifying political and institutional shortcomings, but also directed at enabling a sustained extraction profile. This includes incentives to ensure continued domestic exploration and resource development, and the attraction of foreign direct investment (UNCTAD 2007), as well as investments in knowledge and relevant technology (Wright and Czelusta 2007). This solution is diametrically opposed to that of Ross (2001) and other Resource Curse proponents, who advocate a move *away* from investments in resource extraction. To the extent that the Resource Curse is due to declining extractive output, the cure is not to avoid the initial extractive boom, but to avoid the subsequent decline in extractive output. For example, Botswana was one of the fastest growing economies in the world for three decades, and increased mining output is thought to have been instrumental to that growth (UNCTAD 2007, pp. 144–145; Wright and Czelusta 2007). However, others argue that Botswana's performance was only different from, for example, Somalia (a resource-poor nation) due to Botswana's superior governmental institutions and economic planning (e.g., Acemoglu et al. 2003). Certainly, extractive output and government capability are linked, and the two views are not necessarily inconsistent. My feeling, though, is that there is not enough emphasis on the fact that extractive economies commonly experience the boom–bust cycle depicted in Fig. 1, and that Botswana is on the front end of that cycle. Wright and Czelusta (2007) go even further, arguing that through prudent actions it can stay on the front end of that cycle for at least another 25–30 years.

Wright and Czelusta (2007) and De Ferranti et al. (2002) have emphatically argued that resource-based growth can be sustained over hundreds of years in well-endowed economies, and that where boom–bust outcomes like Fig. 1 have occured, it is because of the lack of will to support exploration, technological progress, and investments in appropriate knowledge to extend and develop the resource base. In other words, while we observe boom–bust cycles, they are not inevitable. Were extractive economies to manage their affairs such that extractive output was sustained, they would likely have the same pro-poor development outcomes as non-extractive economies.

5 Caveats and Areas for Further Research

There are several limitations to the analysis presented here. I have restricted the approach to simple statistical comparisons at the national level, ignoring regional impacts of extraction on the poor. There may well be complicated statistical regularities relating extraction to unfavorable outcomes on the poor that this analysis has

been unable to uncover. The small number of extractive economy growth events in the sample has also required that I ignore the possibility that the extraction of different commodities may have different impacts on the poor. The World Bank data consisting of income growth by quintile is also subject to methodological issues, and must be treated with a healthy degree of caution. I do not have direct measurement of the domestic output of the resource sector in each economy, and instead use trade data as a proxy. It would be of interest to determine the extent to which growth spells in extractive economies are correlated with extraction rates, and the extent to which increasing mineral and energy extraction leads to sustained positive growth and development. Finally, it may also be that the extractive economies that have experienced minerals and energy booms, and corresponding rapid economic growth, are now irreversibly "damaged", with no prospect of the poor benefiting from subsequent extraction-led positive growth spells. Indeed, given all of these caveats, a more sophisticated empirical intertemporal analysis of the relationship among growth spells, changes in extractive activity by type of activity (lootable versus non-lootable resources, energy versus minerals), and the pro-poorness of growth is warranted. I leave this for future research, and present these results only as an introductory investigation of whether or not positive growth in extractive economies, where it has been realized, has been any worse for the poor than in non-extractive economies.

One final point should be made: this analysis has only examined domestic outcomes, and a broader geographic perspective is probably warranted. For instance, the lower incidence of poverty in the Middle East and North Africa (MENA) countries (Adams and Page 2003) may be indicative of an additional benefit of extractive activities in surrounding countries. If resource extraction stimulates worker remittances, and thereby increases consumption by the poorest peoples in neighboring countries, then this would further motivate the role for extraction in sustainable development. An example might be South Africa's remittances to Lesotho and Swaziland, countries which, despite the negative development prospects associated with being small, landlocked, and African (Collier 2007), have medium levels of human development (UNDP 2003). Moreover, and a point that is often overlooked, increased availability of mineral and energy resources lowers the real prices of resource-intensive goods such as grains. In this way, increased extraction activities have an additional, indirect effect on the welfare of the poor by increasing the purchasing power of their income.

Overall, these outstanding research issues indicate that we still have much to learn about the positive and negative effects of extractive activities on the well-being of the poor. In particular, they caution against drawing definitive conclusions, as some have done, that extractive activity hurts the poor. Indeed, what hurts the poor in countries with mineral and energy wealth, in the end, appears to be the failure of the extractive sectors to grow in a steady, persistent manner. If we are interested in the welfare of the poor in extractive economies, less research is needed into ways to diversify away from extractive activity, and more is needed into how extractive activity can be sustained.

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