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Conditioning the "Resource Curse": Globalization, Human Capital, and Growth in Oil-Rich Nations

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Abstract

Since the 1990s it has become conventional wisdom that an abundance of natural resources, most notably oil, is very likely to become a developmental "curse." Recent scholarship, however, has begun to call into question this apparent consensus, drawing attention to the situations in which quite the opposite result appears to hold, namely, where resources become a developmental "blessing." Research in this vein focuses predominantly on the domestic political and economic institutions that condition the growth effects of natural resource wealth. Less attention, however, has been paid to whether or how the context of economic integration has conditioned the domestic political economy of natural resource development. This article specifically addresses this theoretical disjuncture by arguing first that the developmental consequences of oil wealth are strongly conditioned by domestic human capital resources, which, where sizeable, make possible the management of resources in ways that encourage the absorption of technology and development of valuable new economic sectors. In the absence

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of robust human capital formation, however, the archetypal "resource curse" is likely to result. The authors argue moreover that international economic integration further amplifies the divergence between these outcomes by simultaneously raising the growth-enhancing effects of large stocks of human capital and by directly facilitating economic growth. Analysis of global data on growth and oil abundance (1979-2007) supports their main hypotheses that natural resource wealth can be either a "curse" or a "blessing" and that the distinction is conditioned by domestic and international factors, both amenable to change through public policy, namely, human capital formation and economic openness.

Keywords

resource curse, oil, development, globalization, human capital

There is an extensive literature in economics and political science that contemplates the potentially detrimental effects of large stores of natural resource wealth. Economists, naturally, initially focused their interest on the growth-inhibiting effects of resource exploitation, principally emphasizing worries about the "Dutch disease" effects on the exchange rate and the implications this carried for the nonresource economy. Worries about natural resource wealth entered the political science literature, however, focused on a different matter: the "political" resource curse. This line of scholarship contended that "easily taxed" resource endowments could ultimately undermine the stability of governmental institutions, produce rentier states focused on distribution of public largesse, and encourage clientelism and corruption in the relationship between state and society. Some forms of resource wealth have also been linked to authoritarian politics and civil conflict. Economists soon seized on such arguments to propose a second mechanism for the paradoxical association between natural resource wealth and comparatively lower growth rates. Here they argued that efficiency losses induced by the political resource curse were a principal reason for substandard economic performance, as corruption, weak public institutions, and poorly enforced rule of law induced rent seeking, underinvestment, and a chronically mismanaged fiscal budget.

In recent years, cracks have begun to show in the resource curse consensus. For however commonplace malgovernance and economic underperformance have been in oil-rich states, there are also examples that fit very uncomfortably within that paradigm (see Dunning, 2008; Karl, 1997). Indeed, the onset of large rents from North Sea oil production certainly seem not to have

induced ungovernability, weaker rule of law, or a turn toward rentierism in the United Kingdom. In Norway, not only have public institutions managed the resource flows in remarkably forward-looking ways, but also they have used the oil revenue and access to reserves to develop an indigenous and publicly owned capacity in high-tech, deep-water extraction and transport that has produced extensive and very valuable linkages to the broader economy.[1] And of course extensive natural resource wealth has hardly been seen as a detriment to historical political and economic development in either the United States or Canada (Nelson & Wright, 1992). Accordingly, scholars have begun to ask not why and how but rather *when* natural resource endowments are likely to become a blessing or curse to political and economic development.

As important as this research has been, scholars seeking to understand when the resource curse is likely to be observed have paid less attention to the role of globalization, and in particular to the increasing integration of markets for trade in goods as a factor shaping the growth effects of natural resources. In this article we seek to move in this direction by asking two related questions: (a) *When* is natural resource abundance likely to contribute to positive growth? and (b) How does globalization enter this process? With respect to the developmental consequences of natural resource, wealth specifically oil, it is our contention that there are potentially powerful positive *and* negative growth consequences to extensive endowments of natural resources. Resource-abundant states thus tend to sort into two distinct equilibria (Mehlum, Moene, & Torvik, 2006). In one, natural resources are advantageous to economic performance; they provide revenues for public goods provision and institutional improvement and facilitate important linkages to high value-added industrial sectors based on resource extraction and processing. In another is the less felicitous story of natural resource wealth undermining public sector tax capacity, promoting distributional and patronage politics and a tendency toward rent seeking in society that reinforces economic underdevelopment.

What makes the difference? And how does globalization affect these dynamics? We argue that preexisting investments in human capital and industrial development, which may be a legacy of pre–resource era government policy choices, create a sociopolitical context in which resource wealth may become developmentally nutritious or deleterious. Where the underlying manufacturing and industrial base is more developed and thus human capital more widespread, states can leverage natural resource wealth to induce the transfer of technology, create linkages between the resource sector and the broader economy, and improve the quantity and quality of public goods

provision. Globalization, moreover, by broadening opportunities for the diffusion of advanced technology, may hold the possibility to enhance such felicitous outcomes where deeper human capital stocks make it possible for new technologies to be absorbed into local production processes with spillovers for the broader economy. On the other hand, in polities less endowed with high stocks of human capital that did not choose to challenge primary-product-based (typically open-economy) economic strategies before oil became important, resource wealth is more likely to produce the malign equilibrium of clientelism, conflict, and corruption, leading to systematically inferior growth performance across the economy. In such cases, too, the potential benefits of new technologies and know-how brought by trade openness also are less likely to be realized.

We thus locate human capital at the heart of the process whereby states that possess abundant human capital endowments part company with their less-endowed peers and argue that globalization only magnifies this divergence. Indeed, the consequences of the capability to adopt and innovate in the use of technology that is transmitted through economic integration, we expect, will make a profound difference in moving a nation toward a high- or low-growth equilibrium with the cultivation of natural resource wealth. It is crucial to emphasize that human capital is not a gift of nature that is bestowed on some countries but not others. Rather, human capital, like natural resources themselves, must be cultivated and channeled into productive activities to contribute positively to growth and economic development. And human capital is unlikely to emerge in isolation from other industrial policies, nor to have the positive developmental effects observed in the high-growth countries in the absence of industrial policies or public support for research that facilitates the commercialization of scientific know-how (Zucker et al., 1998). High stocks of human capital in this sense are intimately political in origin, as they are the product of public investments in education at all levels.[2] State investments in human capital thus have the potential to release resource-abundant countries from the political and economic "curse" to the extent that such capacity promotes the realization of spillovers from the resource sector to other areas of the economy such as higher value-added manufacturing. And the growth effects of this dynamic should be self-reinforcing to the extent that demands by the economic and middle-class interests vested in a strong educational system maintain pressure on governments to sustain public investments in education. The developmental consequences of public investments in human capital thus cannot be but profound.

In this article we seek first to establish a prima facie case for the plausibility of our claim that human capital formation is a crucial factor shaping the

growth effects of natural resource endowments. We thus emphasize the domestic sociopolitical foundations that may *condition* the way in which resource wealth contributes to growth. At the same time, we explore the effect of globalization on the natural resource–development linkage, as broader exposure to trade should increase the chances for resource-abundant countries to incorporate the newest technologies for the detection and extraction of natural resources. Whether a country can take advantage of such opportunities, we expect, depends on the human capital stocks in the nation. Our analysis provides support for our contention that whether natural resource wealth promotes or undermines growth depends crucially on the accumulation of human capital in a nation, which in turn is a crucial byproduct of a nation's development strategy (Hanushek & Woessmann, 2008). Our findings indicate that trade exposure does not itself mediate the oil–growth linkage but that, like natural resource wealth, globalization's effects on this dynamic are conditioned by the educational endowments in a country. In other words, globalization alone neither increases nor decreases the growth effects of natural resources; only in the context of high human capital stocks do we see that greater exposure to trade increases the growth outcomes associated with natural resource abundance. Although our findings are preliminary, they point to a potential, but crucial, role for the state in the development of human capital, which may allow resource-rich countries to take advantage of the potential gains associated with globalization.

The Price of Oil Wealth or the Proceeds of Oil Wealth?

A rich stream of research linking natural resource wealth and economic growth was stimulated by a series of articles by Sachs and Warner (1995, 1997, 2001) that associated natural resource abundance with substantially lower long-run growth rates. This research contends that Dutch disease—wherein exchange rate appreciation resulting from natural resource exploitation deindustrializes a country by rendering the manufacturing sector uncompetitive—is the critical link between natural resource wealth and the broader economy. The emphasis in this scholarship lies on the manufacturing sector: Insofar as it is characterized by stronger positive externalities and increasing returns to scale, its debilitation induces comparatively lower levels of economy-wide growth (Sachs & Warner, 1995, p. 7). Subsequent analyses, however, have taken a decidedly more institutional turn, emphasizing the political and institutional foundations of the resource curse. Central to this research is the alleged corruption-inducing effects of natural resource

booms, through which revenues derived by the state from natural resource sectors are said to undermine institutional quality, increase rent-seeking behavior, and thus inhibit growth (Gylfason, 2001, 2001; Leite & Weidmann, 1999, p. 9; Papyrakis & Gerlagh, 2004; Robinson, Torvik, & Verdier, 2006). Building on this institutional literature, scholars have identified associations between natural resource abundance and an array of deleterious political outcomes, from withering state capacity to barriers to democratization and the increased likelihood for rebellion and civil conflict (Collier & Hoeffler, 1998, 2005; Karl, 1997; Ross, 2001, 2004).

A more recent stream of research has begun to challenge the ecological determinism of the "resource curse" on both empirical and theoretical grounds. Empirical research points to the divergent growth equilibria observable among resource-rich nations, which include not only the "growth losers" such as Nigeria, Zambia, Sierra Leone, and Angola but also a set of resource-abundant "growth winners" such as Botswana, Canada, Australia, and Norway (Mehlum et al., 2006). This research has brought attention to the factors that may *condition* whether natural resources will contribute positively or negatively to political stability or economic growth (Dunning, 2005, 2008; Fearon, 2005; Ron, 2005; Snyder, 2006). The quality of domestic institutions figures prominently in this research (Bulte, Damania, & Deacon, 2005; Mehlum et al., 2006; Snyder, 2006), although less manipulable factors such as geography, property rights, and historical factor endowments also have important effects on the utilization of resource wealth (Dixit, 2007; Robinson et al., 2006; Schrank, 2004; Sokoloff & Engerman, 2000; Wibbels & Goldberg, 2007). And still others have highlighted the centrality of socioeconomic factors in explaining the differential consequences of resource rents (Morrison, 2011).

Crucially, this line of research contrasts with the conventional view that institutions are heavily defined by natural resource abundance. Rather, institutions themselves are found to mediate the utilization of natural resource wealth, and hence its growth effects, and to vary at least somewhat independently of resource wealth. This view is predominantly state centered, wherein "good" political institutions, that is, those that promote accountability and state competence, are shown to create incentives for politicians to utilize resource wealth in growth-enhancing ways (Dunning, 2005; Robinson et al., 2006) whereas "bad" institutions serve to reinforce political and economic underdevelopment. Good governance thus becomes a crucial factor shaping the growth-enhancing potential of natural resources by means of its effect on political elites' incentives to invest such resources.

The development of revenue-extractive and regulatory institutions also enters prominently in the conditional resource curse literature (e.g., Snyder, 2006;

Snyder & Bhavnani, 2005). Scholars in this vein underscore the conditioning effect of broader macroeconomic institutions on the resource–growth relationship. For Dunning (2005), the effect of natural resource wealth on political and economic outcomes depends crucially on factors beyond the regulatory role of the state, including the international market for the resource and the development of the nonresource private sector. Along the same lines is research pointing to another public good investment that also powerfully conditions the effect of resource wealth, namely, human capital. Although it is well established that human capital is a powerful direct engine of growth (Barro, 1997, 2001), the link between natural resources and human capital formation is much less straightforward. Indeed, for some scholars, a crucial mechanism through which natural resource abundance undermines growth is through its dampening effect on government investments in human capital (Birdsall, Pinckney, & Sabot, 2001; Gylfason, 2001; Wade, 1992). However, other research has challenged this conclusion (Davis, 1995; Stijns, 2005, 2006). Stijns (2006), for instance, demonstrates that natural resources stocks (measured as reserves) are strongly correlated with *higher* stocks of human capital (measured as school attendance). His conclusion is that it is not merely the possession of natural resource abundance that matters; rather, it is the way in which natural resources are exploited that determines their overall growth effect. Such a finding confirms earlier research by economic historians who challenged the view that a country's natural resource endowment is exogenous. Instead, that research found that the ability of a country to utilize its natural resources to generate higher growth depends crucially on the "learning process" through which such exploitation occurs (e.g., David & Wright, 1997).

This is not a new idea, of course, as the notion that human capital, growth, and technology are linked has been around at least since Gerschenkron (1962). For Nelson and Phelps (1966), although the expansion of the technology frontier depends on the rate of innovation, increases in total factor productivity depend on the *implementation* of these discoveries, which in turn vary with the level of human capital in a country. Such a view marked an important divergence from the neoclassical view of technology as an exogenous public good that is shared costlessly (as in Solow, 1956, 1957). Subsequent research thus began to account for cross-national variations in growth by conceptualizing technology as endogenous and only partially appropriable (e.g., Arrow, 1962). And to the extent that technology is difficult and costly to transfer from one country or firm to another, it was found to acquire distinctive, path-dependent characteristics that affect national growth trajectories (e.g., Nelson, 1981; Romer, 1986). Governments have a crucial role in this process, moreover, as the existence of top universities and nationally

funded research at those universities has been found to be a significant predictor of the emergence of intellectual human capital, which in turn provides the locomotive for the growth and commercialization of technology within a country (Zucker et al., 1998).

Technology diffusion across countries also has been shown to diverge from the frictionless and fully appropriable manner that was assumed in early research (Romer, 1986). As an important carrier of new technologies around the world, international trade thus may amplify the differences between the growth trajectories of countries that are and are not able to take advantage of such opportunities to incorporate new technologies into the domestic economy. Indeed, even though early research on trade liberalization indicated a direct growth effect of the removal of tariffs across countries (Krueger, 1983), such changes were later found to amount to only a one-time increase in production possibilities (Lucas, 1988). Such results, however, rested on the assumption that technology is exogenous and shared across countries. Given that technology diffusion accompanies trade openness (Grossman & Helpman, 1990), differences in the capacity to absorb new technologies should thus have long-term consequences across countries that vary in their stocks of human capital. To the extent that the capability to absorb new technologies into domestic industries varies across countries, therefore, globalization's effects should vary quite significantly across nations, with higher growth resulting in some countries but not others.

Indeed, existing research indicates that countries differ starkly in the capacity to incorporate the highest technologies in domestic production. Specifically, the ability of a country to adopt and utilize technology from abroad should depend on its existing stock of human capital (Acemoglu, Gancia, & Zilibotti, 2010; Benhabib & Spiegel, 1994; Lall, 1992) as well as other country-specific factors (Fagerberg, 1994; Mathews, 2001). Technical competence and a country's political and economic institutions (Abramovitz, 1986) as well as linkages across firms within a country (Nelson & Wright, 1992) all have been shown to affect the capacity to incorporate new technology in industrial processes. Such variations in the ability of countries to incorporate technological innovations into the domestic economy—that is, to "indigenize" it—thus should be a crucial factor shaping both the utilization of natural resource wealth to advance economic growth and the capacity for globalization to enhance this process (Acemoglu, 2003; Basu & Weil, 1998; Nelson & Phelps, 1966).[3]

Understanding variations in the capacity to incorporate new technology brings attention to the role of human capital in domestic economic processes. Again, human capital is far from a "taproot" or sufficient condition for growth,

nor is it likely to have such developmentally favorable effects in the absence of a broader array of policies and institutions that promote the broad utilization of technology in the industrial process (Haggard, 2004). Nevertheless, we expect it to be a critical factor that helps to explain crucial differences in the developmental effects of natural resource endowments in the context of globalization. And it is one that implies a central role for the state in the development process. For even though variations in human capital accumulation across countries arise in part from the individual-level decisions to invest in skill formation, a nation's stock of human capital also depends crucially on government investments in education, particularly at the primary level (Heckman, 2000; Psacharopoulos, 1994), and its ability to ensure that a high-quality set of suppliers exists for individuals seeking to acquire skills (Destler & Page, 2010). And it is the broader accumulation of human capital—that is, the average level of skill in the labor market, rather than solely the individual-level human capital investment—that is most important for the overall productivity of the broader economy (Lucas, 1988, p. 18). As Lucas (1988) put it, "Human capital accumulation is a *social* activity, involving *groups* of people in a way that has no counterpart in the accumulation of physical capital" (p. 19, italics in original).

Such aggregate skill levels, moreover, are closely related to state investments in education and constitute "a central part of most development strategies" (Hanushek & Woessmann, 2008, p. 607). Indeed, in much of the developing world, strong public investments in education have been closely related to state-led import-substituting industrialization (ISI) efforts (Bruton, 1998; Lall, 1992). In Asia, for instance, early challenges to the neoclassical assumption that high growth among the newly industrialized countries emerged from a minimal state presence have emphasized how state industrial policies promoted firm-level learning through intervention in markets and price distortions (e.g., Amsden, 1989; Haggard, 1989). For Haggard (2004), industrial policies at the heart of East Asian developmentalism were closely associated with the rapid accumulation of human capital and government efforts to promote the capacity of firms to adopt and utilize new technology, if not to innovate. Such policies include government promotion of high-quality education as well as subsidies for and/or provision of research and development as well as the promotion of coordination across firms (Lall, 1996; Zysman, 1996). The development of human capital in the process of industrialization should have implications beyond the development of competitive export sectors from an infant industry market; such policies should also promote the absorption of new technologies from innovating countries (Barro, 2001, p. 14; Engelbrecht, 1997). In this sense, state promotion of technology

acquisition through investments in education and human capital formation should facilitate establishment of growth-enhancing spillovers from the dynamic sector (e.g., the natural resource sector) to the broader economy.

From this literature we thus draw two basic hypotheses for our preliminary investigation. First, consistent with a broad literature on growth (e.g., Barro, 1991, 2001; Becker, 1993) we expect that oil-rich economies with higher levels of human capital endowments should grow systematically at higher rates than their less-endowed resource-rich peers and also at rates greater than otherwise would be expected as a consequence of their human capital stocks (themselves a direct determinant of growth). That is, higher stocks of human capital should increase the growth effects of the natural resource sector *net* of the well-known direct effect of human capital on growth. Importantly, in investigating this we must assess the growth effects of human capital net of the political regime, for democracy has been linked to growth through similar mechanisms and is likely collinear with human capital (Barro, 2001; Baum & Lake, 2003).

Second, we expect human capital to mediate the impact of globalization on growth in resource-rich economies. That globalization would contribute positively to the utilization of natural resources to sustain high growth is far from ensured. Even though openness may bring the above-mentioned possibilities for economic gains associated with the removal of trade barriers and access to new technology (Grossman & Helpman, 1991; Keller, 2004; Krueger, 1983), there is also a less felicitous side of the story relating to globalization's long history of colonization and purely extractive exploitation of natural resources leading to deindustrialization and declining income in the developing world (Milanovic, 2003, pp. 669-672). Thus, it is crucial that we explore the *conditions* under which the positive and negative outcomes are likely to emerge. Our hypothesis is that any potential benefits of globalization for the political economy of natural resource development are highly conditional: Exposure to trade may promote superior growth rates in a resource-rich nation *only if* the government has in place a set of policies that promote the accumulation of human capital. In this view we provide a "positive" complement to Jensen and Johnston (2011), who argue that globalization can mitigate some of the potentially negative effects of resource wealth.

Empirical Analysis: A Conditional Blessing or Curse?

We begin our empirical analysis by considering two related issues. The first relates to measurement. We examine whether reconceptualizing natural

resource wealth on a production—rather than export—basis undermines the foundations of the general economic and political resource curse arguments: Are oil-rich countries really prone to slower growth? Then, having shown that there is no obvious or necessary link between oil production and economic development, we move to a direct investigation of our principal claim, that the growth effects of natural resource wealth are *contingent* and largely based on endowments of human capital.

Measuring Natural Resource Abundance

We begin by reanalyzing the relationship between resource wealth and economic growth using an alternative to the conventional export-based measure of oil wealth. There is good reason to believe that exports represent an invalid measure of natural resource wealth (Stijns, 2005), including the possibility that some countries with abundant natural resources may consume them domestically in the process of economic development (Schrank, 2004). To avoid any potential bias introduced by the reliance on exports to measure resource wealth, we measure oil *production* in relationship to GDP.[4] (see the appendix for definitions and sources for all variables).

We begin with simple baseline models similar to the original Sachs and Warner resource curse findings but utilizing alternative measures of production and a more contemporary time frame. At first glance, the results in Table 1 provide some evidence, though far from dispositive, that the claims of the classic resource curse scholarship are not as robust as once thought. In one of the four models, there is no measureable effect of oil production on economic growth over the 1980-2008 period, and in another the effect is only weakly discernable. And in the models in which a negative relationship between resource wealth and growth is observed (Models I and III), the effect is sharply reduced or eliminated when an omitted variable—political regime—is included (Models II and IV). This suggests that any relationship between resource wealth and democracy is affected by an association between oil wealth and political authoritarianism (which is itself negatively related to growth in the data). But since major oil producers include some of the most democratic states of the world, including Canada, Norway, the United Kingdom, and the United States, as well as some of the least democratic states, including Saudi Arabia, Iran, and Kuwait (British Petroleum, 2009), this suggests that the negative sign on resource wealth in Model III may be an artifact of the relative distribution of democracies and autocracies among oil producers. There may be simply a lot more undemocratic oil economies—for purely exogenous reasons.

Table 1. Cross-Sectional Models of the Resource Curse on a Production Basis, 1980-2007 (Estimate and Standard Error)

	I	II	III	IV
Oil production to GDP	–0.047***	–0.029**		
	0.012	0.014		
Oil production per capita			–0.005*	–0.003
			0.003	0.002
ln (GDP per capita) in 1980	0.156	–0.077	0.204**	–0.121
	0.093	0.116	0.094	0.130
Investment	0.198***	0.189***	0.182***	0.176***
	0.054	0.056	0.052	0.053
Growth 1970-79	0.060	0.089	0.050	0.094
	0.075	0.069	0.077	0.069
Trade	–0.003	–0.003	–0.003	–0.002
	0.003	0.005	0.003	0.005
Regime		0.081**		0.105***
		0.040		0.037
Constant	–4.034***	–2.506**	–4.142***	–2.122**
	0.946	1.088	0.931	1.026
N	98	97	98	97

Dependent variable = growth 1980-2007. For countries of greater than 1 million population; robust standard errors.
*$p < .1$, **$p < .05$, ***$p < .01$.

Results

Our next step is to consider a more dynamic analysis—permitting us to examine the effects of resource wealth both on cross-national differences, and on within-country variation on key variables. In Table 2 we consider the critical interaction between human capital and oil wealth as it relates to economic growth. And we examine how globalization enters the relationship among natural resource wealth, human capital stocks, and growth. It is our expectation that where human capital levels are higher, far more of the potential benefits of oil wealth can be indigenized into the local economy, and the externalities are thus likely to be substantially more positive. We expect these results to hold controlling for the level of development and the political regime. We are agnostic as to the effect of trade exposure on the resource–growth dynamic where human capital is held constant. Scholars

Table 2. Foundations of Growth: Oil Wealth, Human Capital, and Globalization (Estimate, Standard Error)

	I	II	III	IV	V
Oil production to GDP	0.0180	–0.0413	0.0068	0.0247	0.0018
	0.0156	0.0293	0.0430	0.0159	0.0160
Oil Production to GDP × Human Capital		0.0011**			
		0.0005			
Oil Production to GDP × Globalization			0.0001		
			0.0004		
Human Capital × Globalization				0.0004***	
				0.0001	
Human Capital (oil countries) × Globalization					0.0002**
					0.0001
Human capital	0.0297***	0.0226*	0.0300***	0.0031	0.0250**
	0.0111	0.0117	0.0114	0.0161	0.0113
Investment	0.0868***	0.0871***	0.0870***	0.0976***	0.0878***
	0.0331	0.0331	0.0333	0.0331	0.0330
Globalization	0.0328***	0.0342***	0.0323***	0.0077	0.0320***
	0.0052	0.0054	0.0056	0.0099	0.0052
Wealth (ln)	–0.8595***	–0.8225***	–0.8618***	–0.8455***	–0.8901***
	0.2215	0.2241	0.2235	0.2220	0.2211
Regime	0.0958***	0.1093***	0.0953***	0.1042***	0.1070***
	0.0284	0.0288	0.0287	0.0283	0.0285
Constant	2.1135	2.0822	2.1517	3.4575***	2.4703*
	1.3039	1.3110	1.3276	1.3176	1.3043
N	1,584	1,584	1,584	1,584	1,584

Dependent variable = annual growth rate. For countries with greater than 1 million population, from 1979 to 2008. Robust standard errors. All independent variables are lagged one period.
*$p < .1$, **$p < .05$, ***$p < .01$.

have linked trade directly to higher growth (Dollar & Kraay, 2004; Krueger, 1983) and education levels (Rodriguez & Rodrik, 2000); however, it has also been claimed that natural resource abundance may undermine economic integration (Auty, 1994; Sachs & Warner, 1995). Less is known about the mediating effect of trade exposure on the link between resource production and growth, which we explore as a way to consider the potential for globalization to bring gains from technological diffusion to the domestic resource production process. Where human capital is included in the interaction

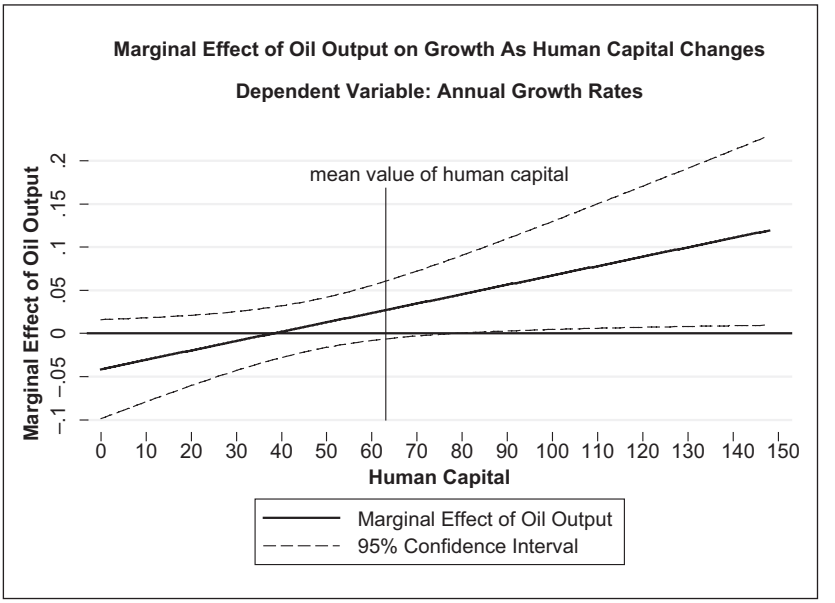

Figure 1a. Marginal effects (Table 2, Model II)

between globalization and natural resource abundance, however, our expectation is that the positive growth effects of oil wealth may be realized.

Table 2 reports our statistical result, that the effects of oil wealth and globalization on growth are conditional on human capital endowments. Examining Model I, oil production as a share of GDP has no significant effect on growth rates. In Model II, however, we interact oil production with human capital endowments and observe that the effect of oil wealth becomes positive and statistically significant as levels of human capital (as measured by the gross secondary education enrollment rate) increase (see Figure 1a for the marginal effects). This result lends support to our contention that it is the way in which oil is used that matters, and the developmental effects of natural resources vary importantly with socioeconomic differences related to human capital endowments. The result is to increase sharply the positive externalities of oil sector development on the broader economy where human capital stocks are high. This mechanism is also consistent with claims about the "political" side of the resource curse that have argued that it is ameliorated

where the ability of citizens to hold elites accountable through political institutions helps to shape resource utilization in ways that avoid the potential corruption and rent seeking that oil wealth might otherwise induce (e.g., Robinson et al., 2006). Such institutions are also likely to be collinear with human capital endowments, and they will likely function more effectively given the expanded, more educated middle classes that are part and parcel of the expansion of human capital.

We posited that the growth effects of human capital may be strengthened further through the mechanism of trade-induced technological diffusion: Human capital facilitates the indigenization of cutting-edge technology into the process of natural resource exploitation and the creation of economic linkages to the broader economy. And by contrast, where local human capital stocks are limited, there may be a "truncation" of technological transfers from foreign direct investment that accompanies economic integration (Engelbrecht, 1997). Models III and IV explore the potential mediating effect of globalization on this dynamic. Although trade exposure in the first two model specifications is positive in its direct effect on growth, we observe in Model III that the interaction between globalization and oil production has no statistically significant effect on growth. Where oil production is zero, however, the coefficient on the globalization variable in Model III suggests that trade exposure continues to have a positive effect on growth. Model IV interacts trade exposure with human capital endowments and finds that, consistent with a rich body of earlier research (as in Coe & Helpman, 1995), there is a significant and positive effect of globalization on growth where human capital stocks are high (see Figure 1b for the marginal effects). The two direct components of the interaction term are not significant, however, indicating that in the presence of limited globalization, human capital has no growth effect. This suggests that many of the benefits of human capital stocks (for growth) depend at least in part on participation in the international economy (as in Grossman & Helpman, 1990). In the final specification, we examine the impact of globalization on the domestic political economy of natural resource development as it concerns human capital. The interaction between human capital and globalization in oil producing nations (Model V) reveals that human capital's effect on growth is robustly positive in interaction with globalization, even with the interaction limited to oil-rich nations.[5]

Our results are preliminary, and we interpret them with caution because of the very basic nature of our measures. But they are suggestive and lend confirmation to the growing body of research emphasizing the highly

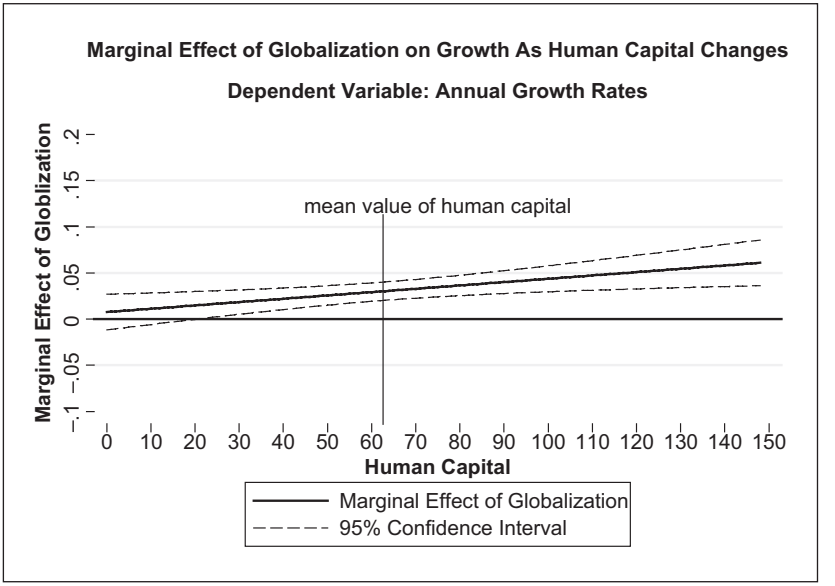

Figure 1b. Marginal effects (Table 2, Model IV)

conditional effects of natural resource (oil) endowments—and economic integration—on economic development (Dunning, 2005; Robinson et al., 2006; Stijns, 2005). Indeed, we find preliminary evidence of two very distinct resource–growth equilibria that emerge out of distinct learning processes through which resources are explored and utilized. It is likely, moreover, that the gaps between these two equilibria may be heightened over time as domestic coalitions of interests that benefit from strong human capital investments emerge to sustain these in higher-growth countries.

Conclusion

We began this analysis with the suspicion that the conventional wisdom that held that natural resource wealth undermines economic growth was at least partially incorrect. Instead of the established view that suggests that oil wealth induces economic malaise, either directly through Dutch disease or indirectly through a political dynamic that induces institutional decay

and malgovernance, we posited an alternative where oil instead *may be* developmentally favorable under some conditions—specifically, those characterized by high human capital endowments. We also suspected that the process of international economic integration, or globalization, would magnify these results by providing opportunities for the diffusion of new technologies that countries with sufficiently high human capital investments could utilize in developmentally favorable ways. Drawing on insights from a literature that views human capital endowments as very important to the viability of global technological transfer, we thus hypothesized that the effect of resource wealth in the context of globalization was likely to be conditional on the stocks of human capital in a nation. In arguing this we have not suggested that resource curse arguments are wholly wrong—for there are quite a few examples of the malign equilibrium. Rather, we posited that two distinct equilibria may result from natural resource production and that human capital endowments are a crucial mechanism shaping into which particular equilibrium a country may fall. With regard to the effect of globalization on this dynamic, we found that greater exposure to trade neither facilitates nor undermines the growth impact of oil wealth; rather, globalization's effect is most powerfully conditioned by human capital endowments. Depending on human capital investments, globalization thus may amplify the divergence between the high- and low-growth paths in resource-rich nations. Where human capital investments are high, in other words, our analysis suggests that oil-rich countries may on average be more likely to take advantage of the growth-enhancing opportunities associated with resource wealth and globalization. A crucial implication of this analysis is to challenge the ecological determinism of some of the "resource curse" literature. Instead, we suggest that developmental outcomes may hinge importantly on policy-relevant national characteristics such as the promotion of human capital.

If our contention is in fact accurate, then the political implications are profound. Human capital endowments are, very crucially, amenable to substantial change through well-understood public policy efforts. And in this way an activist state can undertake the sorts of investments in the expansion of educational access and the transformation of individual incentives that can rapidly build stocks of human capital. Such a state can thus have the capacity to turn what has often been assumed to be a "curse" of nature—large natural resource endowments—into a "blessing." Whether states *will* necessarily do this, of course, is an entirely different question.

Appendix

Variables and Definitions

Variable	*M*	*SD*	Definition
Oil production per capita[a]	48.696	255.291	Oil production (thousands of barrels per day per million population); World Bank (2008) for population, British Petroleum (2009) for oil production
Oil production to GDP[a]	5.989	15.803	Oil production per billion GDP (2000 U.S. dollars); World Bank (2008) for GDP, British Petroleum (2009) for oil production
Investment	23.031	9.072	Gross capital formation to GDP; World Bank (2008)
Growth 1970-1979	2.852	2.962	Decennial average real GDP per capita growth; calculated from World Bank (2008)
Globalization	77.930	47.007	Trade ((imports + exports)/GDP), from World Bank (2008)
Regime	0.609	7.477	Polity2 regime type variable (Marshall & Jaggers, 2002)
Human capital	63.239	34.308	Gross secondary enrollment ratio, from World Bank (2008)
Wealth	7.552	1.594	Natural log of GDP per capita in 2000 U.S. dollars; World Bank (2008)
International oil prices	43.264	23.701	Spot price of crude oil, 2008 U.S. dollars; data from British Petroleum (2009)
Oil production	1,318.654	2,099.110	Production per day in thousands of barrels

a. Data for countries not coded as producers included as zero production.

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Notes

1. Indeed, the Norwegians have created almost de novo since the 1970s one of the few firms on the planet capable of accessing difficult deep-water offshore oil fields (Engen, 2009).
2. The state role is particularly central in ensuring an adequate, high-quality supply capacity for critical public goods such as education (Destler & Page, 2010).
3. Previous research has shown that technology transfers from multinational corporations enhance host country productivity, and hence growth, only when the country has reached a certain human capital threshold (lying between 1.4 and 2.4 years of male secondary school achievement) but that most developing countries do not reach this threshold to benefit in such a way from foreign direct investment (Xu, 2000).
4. Our results are consistent when oil production (thousands of barrels per day) is measured on a per capita basis. We utilize a straight production measure in part to avoid the partial tautology involved in using a value metric—as one of the components of growth itself is the value of output in the oil sector. Since we are not interested in measuring the effects of sudden oil price surges on growth rates, we use a production metric. In a growth model this will be a more conservative specification as it is not inherently partially correlated with total output growth.
5. This of course is only suggestive, for an optimal test of the hypothesis would require the estimation of a triple interaction (among oil production, human capital, and globalization) that is statistically impractical given the constraints of the data and the inherent high degree of multicollinearity.

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