The Varieties of Rentier Experience: How Natural Resource Endowments Affect the Political Economy of Economic Growth*

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Abstract: Many oil- and mineral-rich countries have not fared well since the oil shock of the early 1970s. This paper tests the hypothesis that a developing country's natural resource endowment affects economic growth through its influence on socioeconomic and political institutions. The paper's thesis is that different export structures—whether foreign exchange is derived primarily from manufactures, diffuse natural resources, point-source natural resources, or coffee/cocoa natural resources—create differential institutional capacities to manage shocks and reduce social and economic divisions in developing countries. Using one new and one established measure of natural resource abundance as exogenously-determined instruments, we find evidence to support the hypotheses that countries that are abundant (scarce) in point-source natural resources have weaker (stronger) institutional capacities; and that these endogenously determined institutional capacities are significant and large determinants of growth since the oil shock. Specifically, three-stage least-squares estimates show that (a) being a point-source economy is associated with having worse institutions (at least a one standard deviation decrease); and (b) having worse institutions translates into a GPD per capita that, 25 years after the oil shock, is almost 33 percent lower than countries with better institutions.

Keywords: economic growth, institutions, natural resource endowment

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> The rentier state is a state of parasitic, decaying capitalism, and this circumstance cannot fail to influence all the socio-political conditions of the countries concerned.
>
> Vladimir Lenin, *Imperialism, the Highest Stage of Capitalism*[1]

> It matters whether a state relies on taxes from extractive industries, agricultural production, foreign aid, remittances, or international borrowing because these different sources of revenues, whatever their relative economic merits or social import, have powerful (and quite different) impact on the state's institutional development and its abilities to employ personnel, subsidize social and economic programs, create new organizations, and direct the activities of private interests. Simply stated, the revenues a state collects, how it collects them, and the uses to which it puts them define its nature.
>
> Terry Karl, *The Paradox of Plenty*[2]

I. Introduction

In recent years, many researchers have weighed in with explanations for the big differences in growth performance from the mid-1970s to the mid-1990s among economies with different natural resource bases (see, among others, Auty 1995; Leamer et al 1999; Leite and Weidmann 1999; Ross 1999, 2001; Sachs and Warner 1995 [2000], 1999; Stijns 2001). Woolcock, Pritchett and Isham (2001) hypothesized that the differential capacity to handle growth collapses among economies with different types of export revenue streams—manufacturing, "point source" natural resources (e.g., oil, diamonds, plantation crops), "diffuse" natural resources (e.g., wheat, rice, animals), or coffee/cocoa—is largely a function of varying socioeconomic and political institutions. This paper presents new econometric evidence to support this hypothesis.

Figures 1 and 2 summarize the varied growth performance that we are trying to partially explain.[3] As shown in Figure 1, all developing countries performed relatively well from the mid 1950s to the mid 1970s; they enjoyed a median annual growth rate of 2.3 percent over this

[1] Cited in Ross (2001: 329, fn. 6)
[2] Karl (1997: 13)
[3] These figures originally appeared in Woolcock, Pritchett and Isham (2001)

period. From the mid 1970s until the mid 1990s, by contrast, developing economies endured a growth collapse of "Grand Canyon" proportions, setting back their development agenda by at least a decade.

Figure 1: Smoothed Median Per Capita Growth Rates in 90 Developing Economies, 1955-1997

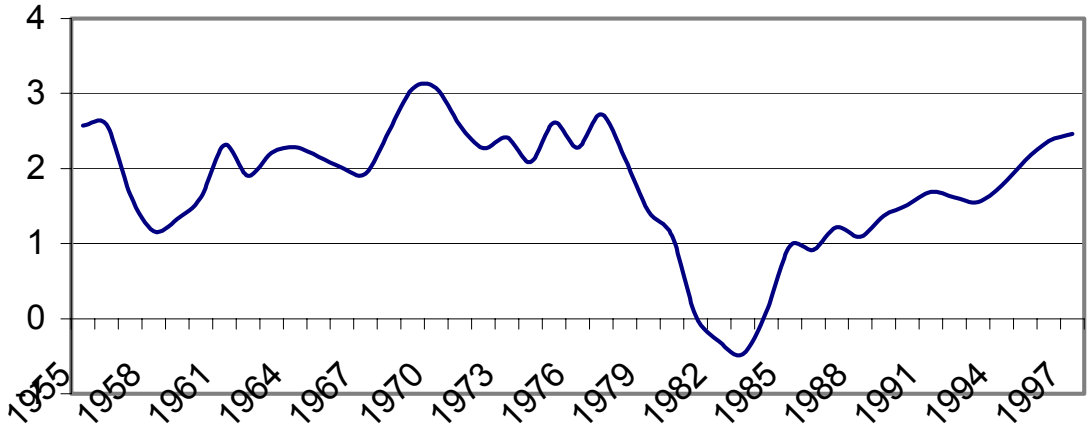
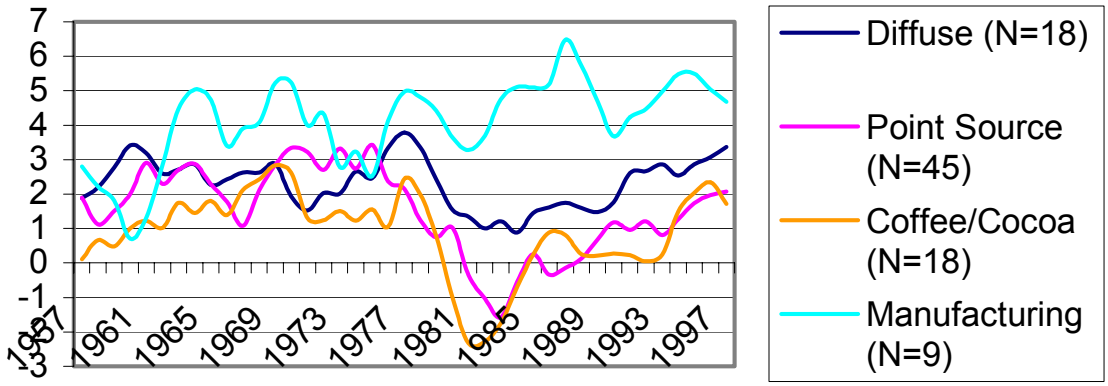


Figure 2 shows that, from the mid 1970s to the mid 1990s, manufacturing, diffuse, point source, diffuse, and coffee/cocoa economies responded differently to the growth collapse. Manufacturers had always done well (note: this sample includes India and Bangladesh, not just the East Asian NICs), and while they experienced a mild downturn in growth rates in the mid 1970s, they responded quickly and effectively. Diffuse resource economies were also adversely affected, but they show a steady rate of recovery. The point source and the coffee/cocoa

Figure 2: Smoothed Median Growth Rates for 90 Developing Economies, 1957-1997



economies, however, experienced a protracted growth collapse. Why?

Our contribution in this paper is to show how the profile of a country's sources of export revenue—i.e., how a country earns its living and pays its bills—affects economic growth. We show that a profile with a bias towards point-source natural resources such as oil, minerals, and plantation crops is strongly associated with societal division and weak public institutions which, in turn, are strongly associated with slower growth.

The rest of this paper is organized as follows. Section II summarizes some recent relevant headlines, details our hypothesis, and motivates the test of our central hypothesis with some illustrative cross-tabulations. Section III presents our econometric model and summarizes the available data for testing the model. Section IV presents our main empirical results, and Section V presents various robustness checks of these results. Section V discusses and concludes.

II: Development of our hypothesis

A. Cases to ponder

Here are examples to illustrate what we are try to get at in this paper, and the difficulties with adopting a single or simplistic view of the relationship between natural resources and economic growth.

Some have argued that resource scarcity is behind civil conflicts in Africa (e.g., Klare, 2001), asserting for instance that a major explanation of the violence in Rwanda was due to conflicts over increasingly scarce land. However, Angola has been dominated by civil strife since the mid 1970s. One 'problem' is that the country is endowed with abundant amounts of some of the best diamonds in the world (News Africa n.d.). Much of the fighting between UNITA and the ruling party is fighting over access to these diamonds (cf. Collier and Hoeffler 2001). Civil strife in Angola has been associated with weak (sometimes non-existent) institutions—political instability and violence, little rule of law, and an underpaid and corrupt bureaucracy—which have presided over an average annual change in GDP per capita since 1973 of –4.3 per cent. Zaire (now Republic of Congo) has been engulfed in conflict in for the last several years and the abundance of col-tan[4] in the Republic of Congo has fueled that African conflict. As revenues from a decades-long expropriation of diamonds, timber, coffee and gold in the eastern half of Congo strengthened Congo's (then Zaire's) elites at the expense of the poor, revenues from Col-tan are now strengthening the rebel Rally for Congolese Democracy. An American importer of col-tran recently observed, based on his experience in this region: "A good civics lesson on how you pay for governance, and the elements of governance, would be

[4] Columbine-tantalite (Col-tan) has recently been declared 'the wonder mineral of the moment': when processed, it is vital for the manufacture of capacitors and other high tech products.

useful in the region" (Vick 2001).

Venezuela, Nigeria, and Indonesia are all oil exporting countries and hence have experienced the same shocks to the price of oil, with oil revenues rising in the 70s and early 80s, and then starting a long decline from the mid 1980s to the late 1990s. Their responses both to the boom and to the negative shocks has been very different, and led to different economic outcomes. Nigeria had a military dictatorship on and off through this period, and while the oil revenues were flowing considerable sums were poured into social expenditures but huge amounts also went into large, wasteful industrial projects, from which billions appear to have been embezzled. Venezuela on the other hand has, since 1958 been one of South America's best functioning democracies with no military governments or coups, and regular transfers of power between major parties. However, economically Venezuela fared not better in responding to the oil boom and busts, with massive volatility, and low growth (Karl 1997; cf. Hausmann, forthcoming). In recent years a populist military man has been elected. Indonesia, on the other hand, had a military dictator for much of this period, but appeared to weather the oil boom and bust quite well. A large part of the 1970s boom went into expansion of schooling and into regional infrastructure, though its slow response to containing the impact of the Asian financial crisis of the late 1990s suggests the quality of its underlying economic and political institutions were in fact very low (on this see Temple, forthcoming).

So is oil wealth a blessing or curse? Observers of Azerbaijan are concerned whether their country can handle the potential bonanza from new oil fields. This and the two other Caspian Sea nations are despotically ruled, ethically divided, and weakened by corruption. While

government officials have promised that oil revenues will go to schools, hospitals and roads, but no plans are in the offing. According to the chief UN representative in Azerbaijan, "This wealth ... will create a lot of problems. It will increase the already substantial gap between the rich and poor, and eventually it will affect political stability" (Kinzer 1999).

In his book *Coffee and Power*, Paige (1997) explores the complex relationship between natural resources, economic structure, and politics. El Salvador, Costa Rica, Honduras, Guatemala, and Nicaragua have similar production structures but have eventually very different political outcomes—a (more or less) well functioning democracy in one, a Marxist revolution (then reversed) in another, and more or less open civil war in the others (on this see also Mahoney 2001). The nature and extent of the role played by coffee elites in these countries in the mid- to late twentieth century appears to have consolidated political institutional trajectories laid down decades earlier.

B. Background: Six "effects" linking natural resources to slow growth

We argue that the oft-observed relationship between rich natural resource endowments and poor development has been explained by two broad schools of thought emanating from, respectively, political science and economics. Each of these schools proposes two basic "effects" by which the resource curse plays itself out.

Political scientists generally—and area specialists in particular—argue that natural resources undermine development through what they term "rentier effects" and (anti)

"modernization effects" (Ross 2001). The rentier effect occurs in states where national budgets based on revenues from the export of fuels and minerals allow governments to mollify dissent (buy off critics through lavish infrastructure projects or outright graft), avoid accountability pressures (because taxes are low), and repress opposition movements, independent business groups, and civil society organizations (and thereby, for some authors[5], the "preconditions" for democracy).

Political scientists argue that states dependent on natural resources also tend to thwart secular modernization pressures—e.g. higher levels of urbanization, education, and occupational specialization—because their budget revenues are derived from a small work force that deploys sophisticated technical skills that can only be acquired abroad (oil is largely extracted by foreign, not domestic, firms). As a result, neither economic imperatives nor workers themselves generate pressures for increased literacy, labor organizations, and political influence. Concomitantly, citizens are therefore less able to effectively and peacefully voice their collective interests, preferences, and grievances (even in nominally democratic countries such as Zimbabwe). In short, resource abundance simultaneously "strengthens states" and "weakens societies", and thus yields (or at least perpetuates) low development (cf. Migdal 1988).[6]

Economists, on the other hand, explain the resource curse via one of two core mechanisms which can be called the "entrenched inequality effect" and the more familiar "Dutch disease". The "entrenched inequality" effect, as articulated by economic historians Engerman

[5] See, for example, Lipset (1959), Moore (1966), Putnam (1993), and Inglehart (1997).

[6] Bates (2000: 107, fn 1) neatly summarizes the rentier effect: "[I]t is useful to contrast the conduct of governments in resource-rich nations with that of governments in nations less favorably endowed. In both, governments search for revenues; but they do so in different ways. Those in resource-rich economies tend to secure revenues by extracting them; those in resource-poor nations, by promoting the creation of wealth. Differences in natural endowments thus appear to the shape the behavior of governments."

and Sokoloff (1997)[7], argues that the diverging growth trajectories of South and North America over the last two hundred years can be explained by reference to the types of crops grown, the extent of property rights regimes enacted to secure their sale, and the timing and nature of colonization (see Acemoglu, Johnson, and Robinson 2001). In North America, crops such as wheat and corn were grown on small family farms, cultivatable land was relatively abundant, but de-colonization occurred early and innovative property rights ensured that land (and assets more generally) could be sold on an open market. In South America, by contrast, crops such as sugar, coffee, and cocoa were grown on large plantations, cultivatable land was relatively scare, de-colonization occurred late, and property rights were weak. Landed elites were able to amass great personal fortunes, resist more democratic reforms, and consolidated power. Ergo, North America became rich, South America did not.[8]

The second effect of natural resources identified by economists centers on fleshing out the "Dutch disease", in which natural resources distort the economy by yielding benefits for the few while drastically altering prices of everything for the many. This is essentially the approach taken in the influential papers by Sachs and Warner (1995 [2000], 1999), who argue that having abundant natural resources makes you less competitive in manufacturing exports, and

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[7] See also Sokoloff and Engerman (2000); cf. Baldwin (1956). Diamond (1998) interprets the entire span of human history through a similar lens.

[8] Consider the contrast between Argentina and United States. For Carlos Diaz-Alejandro, the entire difference in political and economic evolution between Argentina and the United States can be explained by the fact that in Argentina land gets better from west to east, while in the USA land gets better from east to west. In Argentina, population growth led to larger and larger rents on the good land that was divvied up by General Rosas in the 1800s, while in the USA the western expansion successively undermined the position of the elites. In Argentina, many of the powerful families that dominate the Jockey Club today are the same as those from the 1800s, while in the USA no one has ever heard of any of the descendants of the "founding fathers" (which is perhaps why they are so revered; you can imagine how much less we would think of Jefferson if his great great great grandson was tooling a Ferrari around DC living off the huge rents from Monticello). If you drive a short ways out from DC to the Shenandoahs there is a beautiful national park—all on land that was intensively cultivated for centuries until everybody left for greener pastures. In Argentina the families who controlled the large parts of the pampas were also classic nineteenth century liberals—advocates of free trade, property rights, limited government, no industrial policy (except for processing of raw materials like refrigeration for beef).

manufacturing exports have some features like learning spillovers that make them "extra good" for growth. Moreover, an economy based on natural resources is more susceptible to shocks and the spillovers from them impacts on the overall level of economic output. Since the period over which growth is measured is a period in which terms of trade were falling secularly for many natural resource exporters, this is going to appear as a "growth" impact independently of any other mediating influence (like manufactures being "extra good").

Where the political science literature on the resource curse has primarily focused on rentier and anti-modernization effects, and the economics literature on entrenched inequality effects and the Dutch disease, we argue that combining them into a political economy story based on "social divisions effects" and "governance effects" provides a more compelling explanation, at least of the divergent growth experience of developing countries over the last forty years (identified in Figure 2). In essence, we seek to extend—or, more accurately, push back—the seminal Rodrik (1999) explanation of growth expansions and collapses since 1960, in which the key variables are social cleavages and institutional capacity. *Certain types* of natural resources, we argue—namely, "point source" resources such as oil, diamonds, and plantation crops that can be easily captured by an elite—simultaneously exacerbate social tensions and weaken institutional capacity, thereby undermining the ability (and willingness) of governments to respond promptly and deftly to economic shocks (which themselves occur more frequently in resource-rich economies because of price fluctuations in global markets).

Before proceeding to our formal analysis, it is useful to provide a more detailed critique of why alternative stories might not be satisfactory.

"Dutch disease" stories. It is possible that the explanation of the "resource curse" has nothing to do with social and political variables. If there are pure economic explanations of the natural resource curse there is no reason why, controlling for level of development (income, education), natural resource endowments should be correlated with political variables. Second, if there are pure economic explanations of natural resource curse then the type of natural resource endowment should not (necessarily) affect growth, as diffuse natural resources (such as rice and wheat) can just as easily cause dynamic Dutch diseases as point source resources.

"Rentier and Modernization Effects". Here a story of wealth, power, and political and economic transformation begins with some smallish group of elites owning the most valuable resources (usually land); from this land they extract a surplus from the peasants in some way or another (serfdom, slavery, feudal exactions), but then economic circumstances change so that industrialization is necessary. In order for industrialization to happen, however, (a) some of the surpluses must be transferred from existing activities to new industrial activities, (b) at least some labor must be moved to the new activities, and (c) political pressures generated by urbanization and the demands of commerce by a set of semi-professional urban dwellers must be managed, and new services provided.

This combination of economic transformations sets off a series of shifts in political power that can lead in various directions depending on how the coalitions of landed elite/rural producer/urban labor/new industrialists/urban "middle class" plays out. This process can go more or less rapidly and can lead to representative democracy, fascism, corporatism, Marxist dictatorships, or oligarchies.

One implication is that existing elites who control a "point source" resource would resist industrialization because it means creating several alternative sources of power (urban labor, urban middle class, urban industrialists) who each, as their power grows, will want to tax away (or just confiscate) the quasi-rents from the natural resources. In the cross section of levels this implies that countries that are still today dominated by "point source" products are also likely to be dominated by elite politics of one type or another. In this case we do want to bring the OECD countries in, because they are countries which successfully made the transition from agricultural production to industrialization (and beyond) and in the process created functioning democratic polities (although via very different paths as the US/UK path to democracy is very different from the French, Prussian/German, or Japanese). Indeed, viewed over the span of the last hundred years, it is only quite recently that resource-poor countries have become systematically wealthier than resource-rich countries (see Auty 2001: 5).

However, in the cross section, it is very difficult to disentangle the "endowment" from the "evolution of dynamics" effects. That is, among countries that are *today* point source dominated exporters are countries that are so because they have a natural endowment that leads to these type of exports, and which are countries that even though they have an equivalent natural endowment some shock led to a different dynamic in which the oligarchies power was undermined in a self-reinforcing process.

Our claims regarding the importance of "governance" (and, more generally, the conditions under which different states are formed) are derived from students of the early modern state (e.g. Moore and Skocpol), who argue that the increasing need to finance armies led

to the development of greater and greater demands on the state's ability to raise revenues. This led to one of several outcomes, either (a) some kind of accommodation between the sovereign and other classes about their permission/assistance in taxation (classic case: England), (b) an increasingly powerful sovereign who extracted resources directly (classic case: France), or (c) an inability to mobilize revenues because of conflicts between sovereign and nobles which means eventually one gets gobbled (classic cases: Poland, Hungary).

A state which has access to exogenous resources (e.g. the Spanish crown) did not have to extract resources from the domestic population and so did not develop any of the forms of the modern state; hence it fell behind. The lack of a necessity to actively extract taxation led to lower penetration into the citizenry, no ability to mobilize taxes, and thus neither capacity nor legitimacy. This also led to more direct conflict for the control of the state as the state itself was an important source of resources. In this case (a) violent turnovers of the state should be high, (c) levels of non-resource taxation should be low, and (c) modes of political control of the citizenry over the state should be weak.

A related set of claims concerns the role of social and political structures themselves in shaping industrial structures. For Putnam (1993), for example, more or less exogenous political events lead to differences in social structure (depth and nature of typical citizen to citizen interactions) which in turn lead to—independent of economic structure—better governance in the more social capital intensive areas. In this sense, we seek to add a new "determinant" of social capital to the Putnam story, but the determinants of effective governance would still then be driven by social not political structure.

Recent efforts to account for, enhance, and even predict divergent development prospects have sought to include a social dimension, encompassing issues ranging from civil liberties and ethnic diversity to trust and community participation. In this paper, we restrict our coverage to cross-national studies on the effects of social variables on growth.

The first to explicitly incorporate and test social variables in this field were Knack and Keefer (1995; 1997) and Keefer and Knack (1997), who partially explained economic growth rates and patterns of conditional convergence (or divergence) with data from the International Country Risk Guide (ICRG) and the World Values Survey on institutional credibility and trust.[9] Knack and Keefer's results provide moderate support for so-called "Olson effects"—i.e., that social groups can have constraining effects on growth—but (consistent with Putnam 1993) they also argue for the importance of trustworthy, credible political institutions. More recently, La Porta *et al.* (1997), Zak and Knack (1999) and Knack (1999) reaffirmed the importance of social trust for the growth of large firms and economies with data from more countries over longer time periods. Similarly, Mauro (1995) and La Porta *et al.* (1998) show how corruption and lax government institutions undermine growth, while Hall and Jones (1999) argue that the quality of a nation's "social infrastructure" retards productivity.

Africa has provided fertile ground for related studies. Easterly and Levine (1997) argue that high levels of ethnic and linguistic fractionalization in Africa, coupled with high spillover effects of one country's poor economic policies on its neighbors, can explain up to 45% of that region's slow growth rates.[10] Collier and Gunning (1999), echoing Rodrik (1999), argue that

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[9] For an early (though less explicitly "social") analysis in this tradition, see Kormendi and Meguire (1985).

[10] Temple (1998) takes a different approach but reaches broadly similar conclusions. Collier (1999b) maintains that high levels of ethnic fractionalization only have a negative effect on growth in countries that also deny political and civil liberties. Posner (1999) argues that a more accurate indicator is the number of "politically

sub-Saharan Africa is not "different", as popularly imagined, but that it merely has an unhappy confluence of growth-reducing factors: isolationist trade policies; deficient public services; unfavorable geography; political instability; lack of financial depth; high aid dependence; *and* low social capital. These authors distinguish between *civic* social capital, by which they mean cohesion and collective action at the community level, and government (*public*) social capital, the quality of the political and legal infrastructure. On both counts, they argue, social capital in Africa is in short supply, with civic social capital undermined by ethnic fractionalization and high inequality, and public social capital eroded by unselected and unaccountable rent-seeking political elites. Of these various factors, Collier and Gunning (1999) rate lack of openness to trade and low levels of social capital as being the most damaging to Africa's growth.

These stories suggest several things. First, a chain of causation running from economic structure to social variables, to political variables to political outcomes (including perhaps policy responsiveness). Second, in order to get these stories to explain *changes* in economic growth in responses to shocks they need to be combined with other stories about shocks because otherwise there should be a stable relationship between economic growth and social variables over the very long-term (and no particular implications for short run growth changes).

Social Divisions and Institutional Capacity. Rodrik (1999a; 1999b), using similar themes if not words, extends this "lack of social capital" thesis, arguing that countries of all stripes and hues showed remarkably similar growth rates until the shocks of the early 1970s. Accordingly, the key issue to explain is why some countries recovered rapidly from these shocks while others sank into near-permanent decline. For Rodrik, the combined effect of divided societies and weak

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relevant" ethnic groups, not their mere demographic size or diversity. (Groups may be small numerically, for example, but nonetheless control key industries.)

institutions of conflict management explains why the series of eternal shocks in the 1970s were unable to be absorbed. As such, he argues that openness to trade should be a component of, not a substitute for, a national development strategy centered on forging broad domestic social coalitions and constructing effective institutions for managing conflict.

This approach, as we shall see, is particularly important for explaining Pritchett's (1997) "mountains" in the evaluation of output in resource-abundant economies, which are frequently subjected to severe, and potentially destabilizing, economic shocks (Figure 2). This does not suggest that resource economies will have a steady state growth rate that is higher or lower, but that the response to the shock will be less effective because of weak social capacity to respond. In this sense, the natural resource is a double curse because (a) resource dependent economies are more likely to experience a negative shock of substantial magnitude, and (b) resource abundant economies are less likely to have developed socially cohesive mechanisms and institutional capacities for accommodating the shock when it comes.

The political/social dimension of our story can therefore be summarized as follows. Some areas of geographic space are conducive to small holder production on individually owned plots. The interactions among these producers tend to be horizontal relationships of equality. In other areas of geographic space production is conducive to large scale production (e.g. plantations of bananas). In these regions the relationships tend to bind each person to a social superior (noble, land-owner), and the horizontal relationships among producers tend to be ones of distrust. This economic structure then produces a social structure which is conducive to "bad" politics (clientelism) and to "bad" governance (since citizens cannot cooperate to demand better services

from the state).

Summary of the stories

Channel of Mechanisms	Period of the effect	
	Long-run levels	Longish-run growth
Political	Moore, Putnam (Modernization effect)	Ross, Bates (Rentier effect)
Economic	Engerman, Sokoloff (Entrenched inequality effect)	Sachs, Warner (Dutch disease)
Political Economy	Rodrik, Easterly (Social divisions effect)	Rodrik, Pritchett (Institutional quality effect)

C. Our hypothesis

As shown above, the central thrust of most of the research on social capital and growth has been to treat social capital as an independent variable. We argue here that it is worthwhile to look at the effects of different *types* of natural resource endowments on social capital formation, since certain types of natural resource economies appear to experience more volatile growth patterns than others (Figure 2) – and various "social features" seems to be correlated with growth patterns (as shown in the previous sub-section).

Our analysis builds on export base theory and the multiple consequences of different staples for economic linkages and for social relationships. Plantation crops (cotton, sugar processing, tobacco) as well as oil and hard minerals are typically associated with highly concentrated ownership. This renders the state heavily dependent on a small number of owners

(rentier capitalists) for generating its income; the rentier capitalists, in return, are able to extract generous tax breaks, subsidies, and levels of import protection. Moreover, since these types of point source resources tend to be more capital- than labor-intensive, they tend to polarize society between haves and have-nots. In such a setting, it is difficult to generate a socially agreed-upon consensus regarding the management of conflicts. During downswings, vested interests resist reforms that would diversify the economy because this would create "rivals" competing for labor and government influence.[11]

Prosperity may mask these fragile social arrangements, but shocks expose and exacerbate them. Extended over several decades, the trajectory is likely to be one of short-term booms and long-term busts that lead to flawed policy responses and very slow—even negative—growth rates. The transition from an agricultural to an industrial economy is at best painful and may not occur at all if the economy becomes trapped into a dependence on slow-growth staples. Two variations of this scenario can be identified. In the first, the state owns the rentier capitalists so that a regime of rentier autocrats emerges, as with Algeria and Nigeria; in the second, the rentier capitalists effectively own the state, as in Angola and El Salvador, and oligarchic regimes emerge.

Smallholder export crops and staples (wheat and rice, and in some cases coffee and cocoa), on the other hand, display a different pattern of socio-economic linkages. Here, low barriers to entry mean that wealth is more evenly dispersed, since the resource is less amenable to capture by an elite (as in the United States and Australia at the end of the nineteenth century). The state has a greater degree of autonomy because it is not beholden to a small economic group

[11] See Tornell and Lane (1999) for a model of how special interests can dampen economic growth. On the institutional side, their argument is very much in the spirit of this paper: they also note (echoing Barro 1996) that

and must instead appeal to and appease a more diverse constituency. Such a wider constituency tends to favor the mobilization of tax revenues for investments in human capital (education and health care) as well as for economic infrastructure. In addition the wider diffusion of wealth is more conducive to democratic institutions so that state-society relations in smallholder economies generate a more sophisticated social consensus regarding conflict management. Consequently, when shocks occur, capital, labor, and the state have a broader array of social (human and institutional) resources to call upon to help mediate the crisis. This, in turn, fosters greater economic flexibility to adjust from slow-growth to high-growth commodities and escape the staple trap. Extended over several decades, a trajectory of longer-term booms and shorter-terms busts emerges, generating modest but substantial overall growth rates. Diversification into an industrial economy, if not always smooth, nonetheless occurs, and does so more or less evenly.

As detailed below, our approach to test this chain of causality—from natural resource endowments to socioeconomic and political institutions to economic growth—takes a novel methodological step by documenting that it is certain *types* of natural resources, not resources per se, that cause problems.

Our hypothesis can therefore be stated as follows. *Different types of natural resource endowments matter for economic growth by generating a differential capacity to respond to economic (and other) shocks. In particular, countries dependent on point-source natural resources are predisposed to heightened social divisions and weakened institutional capacity, which in turn impede their ability to respond effectively to shocks. The effective and equitable*

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one possible explanation for the distributive struggle in many countries is the attempt to appropriate rents generated by natural resource endowments.

management of shocks—and economic transitions more generally—is a key to sustaining rising levels of prosperity.

II. Creating a measure of export structure

To test this hypothesis, we created classifications of countries, according to their natural resource base. Using UNCTAD's *Handbook of International Trade and Development Statistics* (1988), we assembled data on the leading export staples of every country in 1985 that had a GNP per capita under $10,000 and a population greater than one million. UNCTAD classifies export structures into five categories: foods, agricultural raw materials, fuels, minerals, and manufacturing. Within the leading export category, we listed the two most important commodities, enabling us to classify countries into four types:

- 'Non-resource abundant economies' are comprised of 'manufacturing' economies, which have, since the 1960s, relied primarily on manufacturing for their export earnings. Resource-exporters economies' are comprised of three sub-classifications:
- 'Point source' economies have relied primarily on fuels, minerals, and plantation crops (e.g. sugar);
- 'Diffuse' economies have relied primarily on animals and agricultural produce grown on small family farms (e.g., rice and wheat);
- 'Coffee and cocoa' have relied primarily on these two commodities (classifying them as either 'point source' or 'diffuse' proved problematic since these crops can be grown

either on plantations or small family farms).

We relied on judgments from country and commodity experts when there was some ambiguity about a country's classification. The countries used in this analysis, with their classifications, are presented in Appendix Table 1: the table also includes details about the first and second most important exports that are used to categorize the countries.

How do these classifications of economies differ in terms of the magnitude and composition of export earnings? The first four columns of Table 1 present summary data for these classification and sub-classifications from the World Development Indicators (WDI) (1999).[12] Over the 15 year period before the oil shock, exports in these 90 countries accounted for 25.3 percent of GDP: almost 30 percent among the nine resource-poor countries, and almost 25 percent among the 81 Resource-exporters countries. Among the resource-poor economies, manufactures accounted for 46.7 percent of merchandise exports, in contrast to 10.6 percent in the Resource-exporters economies. Among the sub-classifications of the Resource-exporters economies, point source-based exports (ores and fuels) account for 41.2 percent of merchandise exports in the point-source economies, in contrast to about eight percent in the diffuse and coffee and cocoa economies: diffuse-based exports (food and agricultural) account for 36.4 percent of merchandise exports in the point-source economies, in contrast to 70.9 and 76.5 percent in the diffuse and coffee and cocoa economies, respectively.[13]

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[12] Dropped from the sample were those countries listed by UNCTAD as "socialist" (with the exception of China) and "developed" (Greece, Ireland, and Portugal), and those with growth rate data spanning less than twenty-five years, leaving a final sample size of 90. One might ask: why not include developed countries in this sample? A comparison that includes Canada (diffuse) and other developed countries is likely to be interesting. Our response: we are concerned, as development researchers, about developing country performance. It is worth noting that most of the developed countries – take the OECD – began as diffuse economies, are now manufactures economies, and have pretty good institutions.

[13] The data on manufactures, diffuse, and point share come from the WDI, following Ross (2001). We cannot create a comparable coffee/cocoa share column, because these data – unlike the Statistics Canada data – are not so disaggregated.

Table 1: Export compositions and the natural resource base of selected developing economies

Data source	*World Development Indicators*				*Statistics Canada World Trade Data Base*			
UNCTAD-based Classification	*Exports/GDP*	*Manufactures share*	*Diffuse share*	*Point source share*	*Manufactures index*	*Diffuse index*	*Point source index*	*Coffee and Cocoa index*
All country means	25.3	13.2	51.4	25.3	-0.33	0.05	0.04	0.06
<u>of which:</u>								
Resource-poor	29.8	46.8	33.5	7.3	-0.14	-0.04	-0.17	0.01
Resource rich	24.8	10.6	52.9	26.8	-0.36	0.06	0.08	0.07
<u>of which:</u>								
Diffuse	18.9	10.6	70.9	8.1	-0.34	0.17	-0.08	0.04
Point source	28.7	9.7	36.4	41.2	-0.35	-0.01	0.23	0.04
Coffee and cocoa	20.4	12.7	76.5	8.7	-0.39	0.10	-0.07	0.19

Notes: means of selected export and trade related data for 90 developing economies.
See text for descriptions of country classifications, data and data sources.

The final four columns of Table 1 present summary data (from the Statistics Canada World Trade Data Base) of indices that mirror our four classifications for these classification and sub-classifications.[14] As detailed in Appendix Table 2, they are created by adding net export shares for a range of product and commodity sub-categories: for example, the 'point source index' is the um of petroleum and raw materials net export shares, where raw materials include metals, natural gas, coal, and fertilizers. While these are not available for our full set of 90 countries (see the cautionary footnote below), they provide a useful check that our classifications are basically valid. The 'manufactures index' among the resource rich countries is much lower than

[14] These indices were also used in Leamer *et al.* (1999).

among the resource poor countries: -0.36 compared to –0.14. The diffuse, point source, and coffee and cocoa indices are highest among the corresponding set of UNCTAD-based classifications: moving diagonally in the lower right of the table, 0.17, 0.23, and 0.19, respectively.

To begin to develop our argument that the nature of these varying export compositions affect institutions and growth, Table 2 presents summary statistics about growth rates in these countries of the last 40 years, as well as summary statistics of a range of different institutional variables that have been used recently in a set of papers on the institutional determinants of economic growth (Keefer and Knack 1995; Rodrik 1999a, Kaufmann, Kray and Zoido-Lobatón 2000; Dollar 2000, Ritzen, Easterly and Woolcock 2000, and Easterly 2001).

Growth rate data for the period 1957-1997 was compiled from the Penn World Tables and the World Development Indictors (1999). Single measures -- obtained by calculating averages across decades -- of social and political data were adapted from Kaufmann, Kray and Zoido-Lobatón (1999), Dollar (2000), Freedom House (multiple years) and ICRG (multiple years) (Detailed data descriptions are presented in Appendix Table 2).

Table 2: Growth and institutions among developing economies

		Resource-poor	*Resource-exporters*			
		All	All		of which:	
				Diffuse	Point source	Coffee and cocoa
Growth rates						
1957 - 97		4.16	1.43 ***	1.74	1.57	0.76
	1957 - 74	3.56	2.54	2.03	3.08	1.73
	1975 - 97	4.58	0.65 ***	1.60	0.51	0.08
Institutions						
Source	Variable					
KKZ	Rule of law	0.42	-0.41 **	-0.35	-0.38	-0.56
	Political instability and violence	0.31	-0.45 **	-0.38	-0.48	-0.44
	Government effectiveness	0.48	-0.37 **	-0.31	-0.39	-0.37
	Graft	0.35	-0.40 **	-0.31	-0.41	-0.46
	Voice and accountability	0.01	-0.31	-0.21	-0.35	-0.30
	Regulatory burden	0.39	-0.11	-0.04	-0.18	0.00
ICRG	Law and Order Tradition	3.81	2.85 **	2.80	2.89	2.81
	Quality of the Bureaucracy	3.71	2.59 ***	2.52	2.63	2.55
Freedom House	Political rights	3.98	3.28	3.50	3.26	3.12
	Civil Liberties	3.56	3.35	3.49	3.33	3.24
Dollar	Property rights and rule-based governance	3.33	2.99	3.09	3.01	2.86
Sample size		9	81	18	45	18

Notes: Means of growth rates and institutions, by natural resource base.

See text for descriptions of variables.

The four sources for the institutional variables are Kaufmann *et al.* (2000), Dollar (2000), Freedom House (multiple years), and ICRG (multiple years)

Significance levels (*** = .01, ** = .05, * = .10) for Mann-Whitney test of similar distributions in resource-poor and Resource-exporters countries.

First, this table shows the growth story that we introduced with Figures 1 and 2: since the oil shock, annual growth rates of GDP per capita have been significantly (using the non-parametric Mann - Whitney test) different between the resource poor and resource rich countries: 4.58 and 0.65, respectively. Likewise, growth rates among the Resource-exporters classifications – 1.60, 0.51, and 0.08, respectively – are also significantly (using Mann – Whitney again) different: diffuse economies have done almost as well as their pre-oil shock performance; point source and coffee/cocoa economies have floundered. Second, the case of all eleven institutional variables, the mean is lower (institutionally worse, in all cases) among the Resource-exporters countries: in the case of six of these, this difference is statistically significant: from the KKZ data, 'rule of law', 'political instability', 'government effectiveness', and 'graft'; from ICRG, 'law and order tradition' and 'quality of the bureaucracy.' Third, in the case of the nine institutional variables—the exceptions are 'law and order tradition' and 'quality of the bureaucracy'—the mean is higher among the diffuse economies compared to point source and coffee/cocoa economies (though in no case is this difference statistically significant). As exemplified by the extreme case of Angola, Resource-exporters countries—particularly those with a point source or coffee/cocoa natural resource base—are more likely to have low economic growth and weak socioeconomic and political institutions.

Building on the anecdotes, arguments, and cross tabulations presented in this section, we econometrically test in the next sections whether (a) countries that are abundant (scarce) in point-source natural resources have weaker (stronger) institutional capacities; and (b) these endogenously determined institutional capacities are significant and large determinants of growth

since the oil shock.

III: The econometric model and the data

As discussed and established in many previous studies of the institutional determinants of growth, instrumental variables and three stage least square (3SLS) estimation are improvements on OLS estimation, since the former corrects for the likelihood of omitted variable and simultaneity bias. Making these corrections is critical for the exercise in this paper. Despite the machinations that we report in the robustness test below, it would be shocking if there weren't some omitted variable that affected growth among these countries in this period and that is correlated with our institutional variables of interest. This omission, of course, could lead to a biased estimate of the effect of the institutions. Likewise, it seems obvious that economic growth, to some degree, will effect – through time – a country's socioeconomic and political institutions. The challenge of an exercise like ours is, of course, to find an appropriate instrument: correlated with the regressor of interest and uncorrelated with the error term of the regression of interest. More colloquially, it has to be 'truly' exogenous.

Previously, researchers have used shares of English and European language speakers (Hall and Jones 1999; Kaufmann *et al.* 2000) and ethnic fractionalization (Ritzen, Easterly, and Woolcock 2000) as such instruments in growth regressions[15]. Our basic strategy in this section is to show that the addition of natural resource base variables to an instrument set that also

[15] There is a critical difference between the first two -- Hall and Jones (1999) and Kaufmann *et al.* (2000) – and 'Barro' growth regression papers like Ritzen, Easterly, and Woolcock (2000), the Sachs and Warner set, and this paper: the former use the log of levels of per capita income and output, respectively, as dependent variables; the latter use growth rates of per capita income as the dependent variable. We believe that specifications like those in Hall and Jones (1999) and Kaufmann *et al.* (2000) are in many ways the best way to look at changes in well being (*qua* income). We adopt the 'Barro' specifications in this paper because we are explicitly trying to explain the collapse of growth rates among point source and coffee/cocoa economies, as illustrated by Figure 2.

includes these variables improves the 3SLS estimation[16] of the institutional determinants of growth among 90 developing countries since the oil shock. Specifically, we show that such IV estimates lower the standard error for these estimates and increase—in some cases by a lot—the point estimate for the effect of the institution.

To do so, we first use an econometric model which builds on the system of equations frameworks in Kaufmann *et al.* (2000) and Ritzen *et al.* (2000), in which intuitional variables are endogenously determined. Our econometric analysis differs from those and others as follows: we use a full set of other RHS variables that are know to be associated with growth (unlike Kaufmann *et al.* 2000); and – as noted above -- we use variables associated with the natural resource base as instruments. Specifically, we add two alternative natural resource base variables—from Woolcock, Pritchett and Isham (2001) and Leamer *et al.* (1999)—to an instrument set that includes Hall and Jones language variables (as in Kaufmann *et al.* 2000) and ethnic fractionalization (as in Ritzen, Easterly, and Woolcock 2000)

Our model for the determinants of the growth of GDP per capita from 1975 to 1997 in country i ('$growth_i$') is:

(1) $$I_{ij} = \beta_0 + \beta_1 * NR_i + \beta_2 * W_i + \beta_3 * X_i + \varepsilon_i$$

(2) $$Growth_i = \alpha_0 + \alpha_1 * I_{ij} + \alpha_2 * X_i + \eta_i$$

$$j = 1 \ldots 6$$

where

- I_i is an endogenously-determined institutional variable;
- NR_i is a vector of exogenously-determined 'natural resource base' variables;

[16] This seems to be the estimation technique of choice among the growth *cognoscenti*. 3SLS estimates are more efficient than IV estimates if the error terms below are correlated.

- W_i is a vector of other exogenously-determined variables;
- X_i is a vector of previously-identified determinants of growth,
- ε_i and η_i are error terms with the usual properties.

The data that are used to test his model are listed below. (Detailed data descriptions and sources are presented in Appendix Table 2).

- The six institutional variables (I_i) are 'rule of law', 'law and order tradition', 'political instability', 'government effectiveness', 'graft' and 'quality of the bureaucracy.' As a reminder, these were the six institutional variables that were significantly different between Resource-exporters and resource-poor economies in Table 2.
- The two natural resource base instruments (NR_i) are: dummies for the UNCTAD classifications ('diffuse', 'point source' and 'coffee and cocoa') and; indices from the Statistics Canada classifications (again, 'diffuse', 'point source' and 'coffee and cocoa').
- The other instruments (W_i) are 'English language', 'European language', 'Distance from equator', and 'Predicted trade share' (used in Hall and Jones 1999) and 'ethnolinguistic fractionalization' (used in Ritzen, Easterly, and Woolcock 2000)
- Previously-identified determinants of growth (X_i): 'natural resource share of GDP (1974)'; 'per Capita GDP (1975)'; 'investment price level (1975)'; 'secondary school achievement (1960)'; 'trade openness'; and regional dummies for sub-Saharan Africa, Europe and the Middle East, Latin America, and East Asia.[17]

[17] For a robustness check of adding other independent variables from highlighted in Barro (1991), Levine and Renelt (1992), and Sala-i-Martin (1997), among others, see the next section.

- The growth rate of per capita GDP ($growth_i$) is the mean of this growth rate from 1975 – 1997 (World Bank 1999).

Among the X_i variables, there is one regressor above all that is critical to include and draw attention to: 'natural resource share of GDP (1974).' This is the measure that is used to test the 'natural resource curse' in Sachs and Warner (beginning with 1995). By including it as a regressor, where indicators of the natural resource-base composition of exports are used as instruments for institutions, we can also the following hypothesis: that the 'natural resource curse' can be partially explained by our endogenously determined instruments. This would result in a lower coefficient -- compared to an OLS model -- on 'natural resource share of GDP (1974)' when equations 1 and 2 are estimated simultaneously. We can also test the hypothesis -- using statistical tests from Hausman (..), Hausman and Taylor (..), and Davidson and MacKinnon (1993) -- whether these instruments, like 'natural resource share of GDP (1974),' actually belong in the estimation of the structural equation or are otherwise poorly chosen.

IV: The results

First, we present the results for estimating equation (1). This establishes whether measures of the natural resource endowment predict the nature of socioeconomic and political institutions) (specifically, whether we can reject the null that $\beta_1 = 0$ holds in the estimation of equation 1).

Table 3 illustrates an OLS test of equation (1) for 'rule of law,'[18] where we first add each of the NR_i variables to a model which includes the X_i variables -- specifications (1) through (3) --

[18] The other five institutional variables produce basically similar results to those reported here.

and then add each of the NR_i variables to a model which includes the both X_i and W_i variables -- specifications (4) through (6).[19] These results show that the UNCTAD categories -- 'diffuse', 'point source', and 'coffee and cocoa' -- do help to predict 'government effectiveness' more or less as we would have expected. 'Point source' is statistically significant at the 0.10 level or below in specifications 2 and 5; 'coffee and cocoa' is only in specification 5 (remember for later: this is a test whether each of the categories is statistically different from 'resource poor', the omitted category). The 'point source' category has the lowest point estimate (-0.53 in specification 2; -0.82 in specification 5), and 'diffuse' has the highest point estimate (-0.28 in specification 2; -0.49 in specification 5). We cannot reject the null that the entire vector $\beta_1 = 0$ (the p-values for such f-tests are 0.300 and 0.208). Overall, these results suggest that 'point source' is the critical natural resource determinant of 'rule of law'.[20]

The mostly similar pattern is found with the Statistics Canada indices. The point source index is statistically significant (in this case, not in comparison to an omitted variable[21]) in both specifications. In specification 5, the other two indices, not statistically significant, do have the expected signs and relative (to the point source index) magnitudes. There is one 'surprising' result, in specification 2, 'diffuse' is significant, and its point estimate, while lower than 'point source', is slightly higher than 'coffee and 'cocoa.' Since we use the full set of W's to estimate (1), allow us not to make too much of this result. Finally, in this case, we can easily reject the null that $\beta_1 = 0$.

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[19] The savvy reader might ask why we are not presenting the results from 3SLS versions of the variants of equation (1). Frankly, it is much easier to create this table, when using STATA, with OLS results! An inspection of these results and those of the 3SLS version reveal only very slight differences. See the footnote below on the 3SLS results for all six variables that are comparable to those of specification 6 in Table 3.

[20] A small note about the scale and definition of 'Per capita GDP (1975)' in this table: it is in US$1000, adjusted for purchasing power parity.

[21] Why not use all four Statistics Canada indices here? When they all are used in the test of equation 2 (as detailed below), the system is overidentified. This is not true when only these three are used. The reasons for this will be clarified in due time.

Table 3: The effect of the natural resource base on rule of law													
	Specification	(1)		(2)		(3)		(4)		(5)		(6)	
	Independent variables												
'Determinants of growth'	Per Capita GDP (1975)	0.084	*	0.076	*	0.110	***	0.060		0.042		0.092	**
		(0.044)		(0.045)		(0.040)		(0.045)		(0.046)		(0.042)	
	Investment price (1975)	-0.086		-0.077		-0.054		-0.076		-0.086		-0.050	
		(0.091)		(0.091)		(0.084)		(0.087)		(0.086)		(0.081)	
	Secondary school (1960)	0.029	**	0.029	**	0.028	**	0.019		0.017		0.020	*
		(0.012)		(0.012)		(0.011)		(0.012)		(0.012)		(0.011)	
	Trade openness	0.98	***	0.85	***	0.92	***	0.97	***	0.82	***	0.94	***
		(0.31)		(0.31)		(0.28)		(0.30)		(0.31)		(0.27)	
	Latitude	0.00003		0.00005		0.00010	**	-0.00001		0.00000		0.00007	
		(0.0000)		(0.0000)		(0.0000)		(0.0001)		(0.0001)		(0.0001)	
	Sub-Saharan Africa	0.16		0.43		0.57	*	-0.13		0.22		0.41	
		(0.29)		(0.33)		(0.29)		(0.34)		(0.37)		(0.34)	
	Europe / Middle East	0.61	*	0.91	**	0.93	***	0.60		1.16	**	1.12	***
		(0.35)		(0.38)		(0.32)		(0.38)		(0.46)		(0.37)	
	Latin America	-0.06		0.26		0.35		-0.84	**	-0.45		-0.20	
		(0.29)		(0.35)		(0.30)		(0.42)		(0.46)		(0.43)	
	East Asia	0.16		0.33		0.33		0.22		0.35		0.47	
		(0.37)		(0.38)		(0.33)		(0.38)		(0.38)		(0.35)	
'Other instruments'	English language							-0.14		0.02		-0.04	
								(0.41)		(0.42)		(0.38)	
	European language							0.88	**	0.91	**	0.74	*
								(0.41)		(0.41)		(0.39)	
	Latitude							-0.0074		-0.0096	*	-0.0049	
								(0.0052)		(0.0053)		(0.0048)	
	Predicted trade share							0.32	**	0.25	*	0.11	
								(0.14)		(0.14)		(0.14)	
	Ethnic fractionalization							-0.0007		0.0003		0.0018	
								(0.0029)		(0.0030)		(0.0027)	
Natural resource instruments	Diffuse (UNCTAD)			-0.28						-0.49			
				(0.30)						(0.38)			
	Point source (UNCTAD)			-0.53	*					-0.82	*		
				(0.30)						(0.42)			
	Coffee and cocoa (UNCTAD)			-0.44						-0.75	*		
				(0.35)						(0.43)			
	Diffuse (Stats Canada)					-0.9279	*					-0.5473	
						(0.5276)						(0.6010)	
	Point source (Stats Canada)					-1.2538	***					-1.2873	***
						(0.3025)						(0.3519)	
	Cofee and Cocoa (Stats Canada)					-0.8292						-1.0045	
						(0.6727)						(0.6689)	
	Adjusted r-squared	*0.500*		*0.506*		*0.598*		*0.545*		*0.559*		*0.631*	
	Sample size	*74*		*74*		*74*		*69*		*69*		*69*	
F - test for new variable set (p-values)		--		*0.300*		*0.000*		*0.054*		*0.208*		*0.0034*	
Notes: test of the effect of two different sets of natural resouce base indicators on rule of law													
See test for descriptions of all variables. Significance levels are: *** = .01, ** = .05, * = .10													

What are the magnitudes of these effects? From specification 5, a country that (rather magically) went from being in the point source classification to the resource-poor classification would increase 'rule of law' by 0.82; from specification 6, a country whose point source index fell by two standard deviations (=0.30*2) – as equally magical a change -- would increase 'rule of law' by 0.77. Since the standard deviation of 'rule of law' is 0.78, these represent substantial institutional improvements. The same holds (not shown; we can show you) with the other five institutional variables of interest. In fact, the coefficients of 'point source' in the first stage of the 3SLS estimates of the complete system imply that the effect of this magical change is at least slightly greater than the standard deviation of the corresponding institutions variable. 'Rule of law', it turns out, has the lowest comparable effect; 'government effectiveness', the highest, corresponds to a two standard deviation change![22]

So the results summarized above are what we had hoped for. Controlling for our X's and W's, two different sets of natural resource variables are significant and large determinants of socioeconomic and political institutions.

Next, we present the results of estimating equation (2) with the UNCTAD instruments and the Statistics Canada instruments, respectively. A word about the organization of Tables 4 and 5: each cell in the row with the variable name is a coefficient from an OLS or 3SLS estimate, as noted. The cell below that is the standard error, and the cell below that is the sample size.

[22] Using the first – stage results from specification (6) in Table 4 below, the ratios of the absolute values of the coefficients to the standard deviation are (respectively, for the six variables as listed in Table 4): 1.06; 1.35; 1.25; 2.08; 2.11 and 1.43.

(Appendix Table 3 will show, as an example, the full results from these OLS and IV specifications for 'government effectiveness'.)[23]

[23] An important word about the results reported below in Table 5 for this 'zero draft'. We don't yet have the full set of available data for these natural resource indices based on the Statistics Canada trade data [GWEN, LET'S TALK!]. Thus, for about 30 of the countries used in the samples in Table 5 (which range from 68 to 77), estimated natural resource indices are used. These estimated indices are generated with stepwise regression models, where the potential determinants include the WDI export shares reported in Table 1 (for a range of years), regional dummies, and the UNCTAD dummies. The reader is invited to insert his/her violent objection to this technique here: _____. Happily, we can report that VERY similar coefficients -- with (as one would expect) larger standard errors – can be generated by using smaller samples (about 45 or so) with only the actual indices.

Table 4: The institutional determinants of growth, accounting for the natural resource endowment:												
	UNCTAD variables as the natural resource instrument											
	Estimation procedure	OLS		3SLS		3SLS		3SLS		3SLS		3SLS
	Instruments	-		Partial W		Natural resources		Partial W and natural resources		Full W		Full W and natural resources
	Rule of law	1.19	***	1.63		2.09	*	1.82	***	1.18		1.48	**
		(0.33)		(1.11)		(1.07)		(0.71)		(0.73)		(0.62)	
		69		69		69		69		69		69	
	Law and order	0.63	*	1.72		2.26	*	1.91	***	1.39	**	1.55	**
		(0.32)		(1.29)		(1.37)		(0.73)		(0.65)		(0.61)	
		60		60		60		60		60		60	
	Political instability	0.49		1.51		2.41	*	2.20	**	1.17		1.56	**
		(0.32)		(1.30)		(1.45)		(0.94)		(0.80)		(0.72)	
		65		65		65		65		65		65	
	Government effectiveness	0.72	**	1.74		2.01	*	2.04	***	0.77		1.23	**
		(0.36)		(1.36)		(1.07)		(0.78)		(0.85)		(0.61)	
		66		66		66		66		66		66	
	Graft	1.06	**	2.24		2.42	**	2.21	***	1.75	*	1.86	***
		(0.42)		(1.57)		(1.23)		(0.77)		(0.93)		(0.69)	
		65		65		65		65		65		65	
	Quality of bureacracy	0.15		1.19		0.14		0.81		1.28		0.76	
		(0.29)		(0.90)		(0.71)		(0.51)		(0.89)		(0.50)	
		60		60		60		60		60		60	
Note: the coefficients, standard errors, and sample sizes from six multivariate regressions for each of six institutional variables.													
	The dependent variable is per capita growth from 1974 - 1997. The results from other covariates in the model are not reported here.												
	Partial W instruments are the languages variables and 'latitude'; *Full W* 's add 'ethnic fractionalization' and 'predicted trade share.'												
	Significance levels are: *** = .01; ** = .05; * = .10. See the text for descriptions of the variables and the econometric specifications.												

Table 5: The institutional determinants of growth, accounting for the natural resource endowment:

Statistics Canada variables as the natural resource instrument

Estimation procedure	OLS		3SLS		3SLS		3SLS		3SLS		3SLS	
Instruments	-		Partial W		Natural resources		Partial W and natural resources		Full W		Full W and natural resources	
Rule of law	1.19	***	1.63		1.05	*	1.09	**	1.18		0.99	**
	(0.33)		(1.11)		(0.56)		(0.51)		(0.73)		(0.50)	
	69		69		69		69		69		69	
Law and order	0.63	*	1.72		0.84		1.10	*	1.39	**	1.16	**
	(0.32)		(1.29)		(0.69)		(0.62)		(0.65)		(0.57)	
	60		60		60		60		60		60	
Political instability	0.49		1.51		1.13	*	1.12	*	1.17		0.93	*
	(0.32)		(1.30)		(0.65)		(0.59)		(0.80)		(0.55)	
	65		65		65		65		65		65	
Government effectiveness	0.72	**	1.74		1.34	*	1.32	*	0.77		0.69	
	(0.36)		(1.36)		(0.79)		(0.69)		(0.85)		(0.59)	
	66		66		66		66		66		66	
Graft	1.06	**	2.24		1.38	*	1.51	**	1.75	*	1.39	**
	(0.42)		(1.57)		(0.77)		(0.69)		(0.93)		(0.68)	
	65		65		65		65		65		65	
Quality of bureacracy	0.15		1.19		1.37	*	1.37	**	1.28		0.93	*
	(0.29)		(0.90)		(0.81)		(0.62)		(0.89)		(0.51)	
	60		60		60		60		60		60	

Note: the coefficients, standard errors ,and sample sizes from six multivariate regressions for each of six institutional variables.

The dependent variable is per capita growth from 1974 - 1997. The results from other covariates in the model are not reported here.

Partial W instruments are the languages variables and 'latitude'; *Full W*'s add 'ethnic fractionalization' and 'predicted trade share.'

Significance levels are: *** = .01; ** = .05; * = .10. See the text for descriptions of the variables and the econometric specifications.

The results in Tables 4 and 5 can be summarized as follows. First, when the languages variables and 'latitude' are used as instruments for each of the six institutional variables -- labeled 'Partial W' in the tables -- the resulting coefficient (specification 2) is usually not significant (although a Hausman test that the efficient estimate (OLS - specification 1) and the consistent estimate (3SLS – specification 2) are equal cannot be rejected). Put another way, the language variables and 'latitude', on their own, are not good enough predictors of the institutions variables – and thus cannot solve the OMV and simultaneity problems that are likely present in the OLS models (specification 1).

By contrast, when the UNCTAD variables (Table 4) or the Statistics Canada variables (Table 5) are the only the instrument set (specification 3), this usually generates an estimate that is greater than the OLS estimate and is significant. The exceptions are 'quality of the bureaucracy' in table 4 and 'law and order' in Table 5.

When the languages variables and 'latitude' are added to the natural resource variables (specification 4), things get even better: in nine of the previous 12 cases, this lowers the standard error enough to notably increase the significance of this larger (compared to OLS) estimate.[24]

One might say that these results so far tell us little: maybe there are plenty of alternative instruments – including trade-related ones -- that could do this. Well, specification 5 shows that if you add 'ethnic fractionalization' and 'predicted trade share' to the languages variables and 'latitude', the estimates become significant in only two cases in each table (remember, the relevant comparison here is with specification 2). But

[24] Notably?: by this we mean from the 0.10 level to the 0.01 level in most cases in Table 4, and from the 0.10 level to the 0.05 level in most cases in Table 5. Given the measurement error that is present

when the natural resource variables are added to these -- that is, when the full instrument set of W's and NR's are used -- the estimate is significant in five cases of six cases in each table (and again, usually quite larger than the OLS estimates).[25]

In just about all cases (not reported in these tables) germane statistical tests come though fine (following the empirical strategy of Summers and Pritchett (1994)): Hausman tests of equality of the OLS and IV coefficients: Hausman-Taylor tests of the exogeneity of the other instruments (in this case, all instruments compared to languages and 'latitude'); and tests for the over-identification of the system of equations.[26] Overall, what do these tests tell us: that our instrument sets are 'exogenous' -- no instrument, including the natural resource base variables, seems to belong in the structural equation -- and that we have not used too many instruments to generate these results.

Now, remember the question posed above: will the inclusion of these endogenously generated instruments in a system of equations lessen the influence of 'natural resource share of GDP (1974)'? The answer is no. The coefficient on this proposed measure of the 'natural resource curse' does not change significantly from specification 1 – the OLS estimate – to the other specifications. (See – soon -- the illustrative example in Appendix Table 3). So to some degree, we are still left with a

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because of the construction of missing Statistics Canada data (see the previous cautionary footnote), we speculate that the pattern in Table 5 will improve when these data are fully updated.

[25] In the cases of 'government effectiveness' and ' property rights in Table 5, the addition of the Statistics Canada variables lowers the relevant p-values – that is, comparing specifications 5 and 6 – from 0.26 to 0.19 and from 0.17 to 0.15.

[26] And, as illustrated in Table 4, the 'incremental r-squareds' of the first stage regression (see the example in the appendix) show that the NR variables 'improve' the estimation of the institutional variables (Shea 1997).

mystery: why does this variable still significantly affect growth, even when the effect of the composition of exports on institutions is accounted for?[27]

The results in this section comprise the econometric punch line of this paper. Much often than not, using either of two measures of natural resource endowment as exogenously determined instruments increases the statistical significance of the estimate of an institution's effect on growth, and the point estimate is usually a lot higher.

What are the implications of this higher estimate? In the first part of this section, we noted that a large change in the composition of a country's natural resource endowment – a magical shift away from point source dependence – is associated with an improvement of one standard deviation (or more) of the institutions variables. How might such a improvement translate, based on our econometric model, translate into a change of economic growth?

[27] One potential answer is that this measure captures the affect of being in an earlier period of an economic 'take off' (or, if you prefer, before the realization of a 'threshold effect'). A developing country that has not yet industrialized is likely to produce a higher share of primary products compared to one that has. If the rapidity of this industrialization path is determined by other influences besides those in this system of equations, this coefficient could persist because of OMV bias. We admit that it's hard to point to what influences these might be, particularly given the seemingly exhaustive tests of Sachs and Warner (1995 and subsequent years) to drive out this result.

Table 6: The implications of the estimated effects of institutions on economic growth

	Magnitude of change of growth rate:		
	with OLS estimates	with IV estimates	difference (IV - OLS)
Rule of law	0.93	1.15	0.23
Law and order	0.60	1.47	0.87
Political instability	0.41	1.29	0.89
Government effectiveness	0.52	0.89	0.37
Graft	0.66	1.15	0.50
Quality of bureaucracy	0.15	0.75	0.60

Note: incremental changes of per capita growth rates based on standard deviation changes of institutional variables. See the text for details of these calculations.

Using the results from the UNCTAD variables in Table 4, Table 6 presents the product of the standard deviation of each institutional variables and: the OLS coefficient (specification 1); the full IV coefficient (specification 2)); the difference between the OLS and the full IV coefficient (specification 3). Measured this way, using the full set of instruments dramatically increases the magnitude of the effect of institutions on the standard of living. To illustrate, take the median of these figures from specification 2 (1.15): this translates into a GPD per capita that, *ceteris paribus*, is almost 33 percent higher, 25 years after the oil shock, among countries with better institutions (measured by one standard deviation change) than countries with worse institutions. (The equivalent

calculation for the OLS estimate is 15 percent.) The large magnitude of this figure – and the overall statistical evidence reported in this section – is consistent with our hypothesis: that the dependence on point source endowments in selected developing countries has dramatically lowered the standard of living *via* socioeconomic institutions that affect growth.

V: Potential weaknesses of the results

What are the weaknesses of these empirical results – and how do we address these weaknesses? Put another way, where are 'the bodies buried'? (Pritchett, personal phrase) For this draft, we just summarize what we've done with an annotated list.

1. Why not other estimation technique? (SAME RESULTS WITH 2SLS)
2. Does this story work with the other institutional variables in Table 2? (NO)
3. Does this hold up with other X variables – including the reader's favorite? (YES, SO FAR. WILL TRY SOME OTHER SUSPECTS, INCLUDING MANZANO AND RIGOBON'S 'DEBT OVERHANG' (2001), WHICH SEEMS TO RAISE INTERESTING ISSUES FOR THE RESULTS IN THIS PAPER AND THOSE OF SACHS AND WARNER.)
4. What if some other quality of the relatively small number (nine) of 'resource poor' countries is driving these results? For example, the East Asian NICs, which are notorious drivers of a whole range of (sometimes specious) growth results. WE GET

SIMILAR RESULTS, IN JUST ABOUT ALL CASES, IF WE ELIMINATE SOUTH KOREA, HONG KONG, SINGAPORE AND TAIWAN FROM THE SAMPLE (WITH, AS ONE WOULD EXPECT, SOMEWHAT LOWER COEFFICIENTS). AND NB: BECAUSE OF DATA LACUNAE, CHINA IS NOT IN THE ECONOMETRIC SAMPLE.

5. The UNCTAD variables have weaknesses as NR instruments. First, they are dummies – and much of the predictive power comes from the 'resource rich'/'resource poor' distinction as opposed to the 'point source', 'diffuse', 'coffee/cocoa' distinction. (Remember: in the first stage regressions, we could reject the null that the 'point source' countries are statistically different from 'resource poor'; by inspection, we can not reject the null that 'point source', 'diffuse' and 'coffee/cocoa' are statistically different from each other). THE STORY IS NOT AS STRONG – AGAIN, NOT SURPRISING – BUT IT MOSTLY HOLDS.
6. Another worry (still with the UNCTAD variables): does the distinction among the resource rich countries make <u>any</u> difference (after all, we played it up a lot in the bulk of the first part of the paper!). What happens if you eliminate <u>all</u> of the 'resource poor' countries from the samples, and then explicitly test the 'point source', 'diffuse', 'coffee/cocoa' distinction? THE STORY AGAIN IS NOT AS STRONG – AGAIN, NOT SURPRISING – BUT IT ALSO MOSTLY HOLDS: IN A NUMBER OF CASES, THE COEFFICIENT IN SPECIFICATION 3 IS NO LONGER SIGNIFICANT, WHILE THE REST OF THE PATTERN HOLDS.

VI: Discussion and conclusion

At first glance, ours are stultifying results for the policy maker: like Putnam's (1993) medieval guilds and choral societies, it is hard to imagine how a World Banker can change our underlying cause of poor performance – a country's natural resource endowment. We admit: it is hard to get beyond this first glance.

But here's why we think it is important to shed light on these results. Dollar and Pritchett (1999) illustrate the power of institutions, and what donors should (and most important, should not) do in the face of varied institutional performance among potential aid recipients. Our results suggest how entrenched – and 'environmentally determined' – that poor institutions can be (cf. Wade [1988], at micro level). So these results, in a certain sense, further raise cautions about casual attempts at institutional reform. Poor institutions are deeply rooted.

So what can be done? Contrast Chad ('institutional' conditionality from the World Bank on their oil loan, which looks disastrous so far: money is going, defiantly, to the purchasing of arms) to Qatar story in the *New Yorker* (Weaver 2000). In the latter case, the head of state, recognizes that the natural resource gravy train – including the institutions that have gone with it – is leaving the station. What is he trying to lead?: reform from within. He has decreed (!) that Qatar will become a democracy: censorship is out, universal suffrage and elections are in.

We are hopeful that in some cases, donors can – if they're lucky – gently nudge

along such reforms. At very least, donors should not maintain (perceived) 'lifeline' aid that prevents the likelihood of nascent reforms from even getting started.

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Appendix Table 1: Details on the export classifiactions derived from UNCTAD data							
Export classification	*Country*	*Year*	*Description of first and second most important exports*	*SIC export code for first*	*SIC export code for second*	*Percent of total exports*	*Percent of category exports*
Manufacturing	Bangladesh	1985	Woven textiles, textile	653	656	20, 19	65.8
	China	1985	Vehicles Parts, knitwear	784	845	6, 5	35.9
	Hong Kong		Manufacturing				
	India	1985	Pearl, clothing	667	841	11, 9	58
	Korea, Republic	1985	Ships, clothing	735	841	16, 14	91.3
	Nepal	1985	Floor cover, clothing	657	841	15, 12	59.1
	Singapore		Manufacturing				
	Taiwan, China						
	Turkey	1985	Clothing, Textile	841	651	16, 6	61
Diffuse	Argentina	1985	Wheat, Oil seeds and nuts	041	221	13, 10	66.1
	Burma / Myanmar	1985	Rice, Wood	042	242	31, 33	56.5
	Gambia	1985	Oil seeds, veg oils	221	421	25, 21	84
	Guinea-Bissau		Fruits				
	Honduras	1985	Fruit, coffee	051	071	38, 25	84.7
	Lesotho						
	Malaysia	1985	Crude petrol, veg oil	331	442	23, 13	31.5
	Mali	1985	Cotton, Live animals	263	001	56, 30	58.6
	Mozambique	1984	Fish, fruit	031	051	36, 19	69
	Pakistan	1985	Cotton, rice	652	042	12, 12	61.9
	Panama	1985	Fruit, Fish	051	031	28, 21	78
	Philippines	1985	Special trans, Veg oil	931	422	30, 9	26.9
	Senegal	1985	Fish, Veg oils	031	421	14, 13	38
	Somalia	1985	Live animals, Fruit	001	057	79, 18	85.6
	Sri Lanka	1985	Tea, Clothing	074	841	39, 22	47.4
	Thailand	1985	Rice, Veg	042	054	13, 9	46.2
	Uruguay	1985	Wood, Meat	262	011	19.3, 14.	46.1
	Zimbabwe	1985	Tobacco, Pig Iron	121	671	23, 12	36.3
Point source	Algeria	1985	Petroleum products, crude petrol	332	331	36, 32	97.6
	Angola	1985	Crude petrol, petroleum products	331	332	76, 5	84.9
	Benin	1982	Cotton, Cocoa	263	072	32, 27	46
	Bolivia	1985	Tin, gas	687	341	23, 52	55.7
	Botswana		Diamonds				
	Burkina Faso	1985	Cotton, Live animals	263	001	47, 13	56.8
	Chad	1980	Cotton, Live animals	263	001	61, 18	79.8
	Chile	1985	Copper, nonferrous ore	682	283	33, 10	58.3
	Congo	1985	Crude petrol, petroleum products	331	332	89, 4	93.3
	Dominican Repub.	1985	Sugar, pig iron	061	671	28, 14	42.7
	Ecuador	1985	Crude petrol, coffee	331	071	64, 7	66.7
	Egypt	1985	Crude petrol, cotton	331	263	51, 13	68.1
	Fiji		Sugar				
	Gabon	1985	Crude petrol, wood	331	242	84, 6	81.2

Appendix Table 1 (continued)							
Point source (continued)	Guinea						
	Guyana						
	Indonesia	1985	Crude petrol, gas	331	341	48, 18	68.6
	Iran	1987	Crude petrol, tapestry	331	657	95, 2	95.8
	Iraq	1985	Crude petrol, fruit	331	051	95, 0	98.8
	Jamaica	1986	Inorganic elements, nonferrous me	513	283	40, 20	51.9
	Jordan	1985	Fertilizers (crude), Fertilizer (manu	271	561	35, 14	43.3
	Liberia	1985	Iron, rubber	281	231	63, 19	62.9
	Malawi	1983	Tobacco, tea	121	074	48, 24	96
	Mauritania	1985	Iron, fish	281	031	44, 40	58.3
	Mauritius	1985	Sugar, clothing	061	841	47, 29	49.8
	Mexico	1985	Crude petrol, petroleum products	331	332	56, 5	60
	Morocco	1985	Fertilizers, Inorganic elements	271	513	23, 16	40.5
	Namibia						
	Niger	1981	Uranium, live animals	286	001	81, 14	80
	Nigeria	1985	Crude petrol, cocoa	331	072	90, 2	96.7
	Oman						
	Papua New Guinea	1985	Nonferrous metal, Coffee	283	071	35, 14	45.1
	Paraguay	1985	Cotton, Oil	263	221	43, 33	49.5
	Peru	1985	Petrol, nonferrous metal	332	283	16, 14	40.8
	Saudi Arabia						
	Sierra Leone	1985	Pearl, Nonferrous metal	667	283	36, 26	34.8
	South Africa	1985	Special, Coal	931	321	54, 6	34.2
	Sudan	1985	Cotton, Oil Seeds	263	221	48, 15	71.3
	Syria	1985	Crude petrol, petroleum products	331	332	49, 19	74.1
	Togo	1985	Fertilizers, Cocoa	271	072	49, 16	53.6
	Trinidad & Tobago						
	Tunisia	1985	Crude Petrol, Clothing	331	841	40, 17	44.5
	Venezuela	1985	Crude petrol, petroleum products	331	332	46, 29	80
	Zaire	1985	Copper, Crude petrol	682	331	45, 22	44.2
	Zambia	1985	Copper, zinc	682	686	88, 2	93.4
Coffee/cocoa	Brazil	1985	Coffee, petroleum products	071	332	10, 7	37
	Burundi	1985	Coffee, tea	071	074	84, 6	92.2
	Cameroon	1986	Coffee, cocoa	071	072	28, 22	52.5
	Central African Rep	1985	Coffee, Wood	071	242	35, 24	41.6
	Colombia	1985	Coffee, petroleum products	071	332	51, 13	59.3
	Costa Rica	1985	Coffee, fruit	071	051	30, 24	60.5
	Cote d'Ivoire	1985	Cocoa, Coffee	072	071	32, 25	68
	El Salvador	1985	Coffee, Sugar	071	061	63, 4	51.3
	Ethiopia	1985	Coffee, hides	071	211	63, 13	71.2
	Ghana	1985	Cocoa, Aluminum	072	684	66, 6	69.3
	Guatemala	1985	Coffee, Crude veg materials	071	292	35, 8	58.1
	Haiti	1985	Coffee, Clothing	071	841	27, 16	74.2
	Kenya	1985	Coffee, tea	071	074	27, 25	63.6
	Madagascar	1985	Coffee, spices	071	075	39, 29	79.2
	Nicaragua	1985	Coffee, Cotton	071	263	38, 33	58.2
	Rwanda	1985	Coffee, Tin	071	687	43, 9	76.4
	Tanzania	1985	Coffee, Cotton	071	263	39, 11	68.1
	Uganda	1985	Coffee, Hides	071	211	71.3, 6.9	90
Notes: Export classifications based on data from UNCTAD (1988)							
See the text for a description of the classification methodology							

Appendix Table 2: Data sources and descriptions – TO BE FINALIZED		
Data type	*Series*	*Description and source*
Natural resource base	All WDI material	Series: Fuel exports (% of merchandise exports) (TX.VAL.FUEL.ZS.UN) Fuels comprise SITC section 3 (mineral fuels). For more information, see WDI table 4.5.
		Series: Agricultural raw materials exports (% of merchandise exports) (TX.VAL.AGRI.ZS.UN) Agricultural raw materials comprise SITC section 2 (crude materials except fuels) excluding divisions 22, 27 (crude fertilizers and minerals excluding coal, petroleum, and precious stones), and 28 (metalliferous ores and scrap). For more information, see WDI table 4.5.
		Series: Food exports (% of merchandise exports) (TX.VAL.FOOD.ZS.UN) Food comprises the commodities in SITC sections 0 (food and live animals), 1 (beverages and tobacco), and 4 (animal and vegetable oils and fats) and SITC division 22 (oil seeds, oil nuts, and oil kernels). For more information, see WDI table 4.5.
		Series: Manufactures exports (% of merchandise exports) (TX.VAL.MANF.ZS.UN) Manufactures comprise commodities in SITC sections 5 (chemicals), 6 (basic manufactures), 7 (machinery and transport equipment), and 8 (miscellaneous manufactured goods), excluding division 68 (non-ferrous metals). For more information, see WDI table 4.5.

		Series: Ores and metals exports (% of merchandise exports) (TX.VAL.MMTL.ZS.UN) Ores and metals comprise the commodities in SITC sections 27 (crude fertilizer, minerals nes); 28 (metalliferous ores, scrap); and 68 (non-ferrous metals). For more information, see WDI table 4.5.
		Series: Merchandise exports (current US$) (TX.VAL.MRCH.CD.WT) Merchandise exports show the f.o.b. value of goods provided to the rest of the world valued in U.S. dollars. They are classified using the Standard International Trade Classification (SITC). Data are in current U.S. dollars. For more information, see WDI table 4.5.
Natural resource instruments	All Leamer material	
	All UNCTAD material	WP and I (2000)
Other instruments	Ethnic fractionalization	Ethnolinguistic fractionalization index (measures the probability that two randomly selected persons from a given country will not belong to the same ethnolinguistic group). Mauro (1997?), initially from the Atlas Narodov Mira (Department of Geodesy and Cartography of the State Geological Committee of the USSR, Moscow, 1964) and Taylor and Hudson (World Handbook of Political and Social Indicators, 1972)
	Languages	Hall and Jones 1999
Institutions		
	CPIA	Property rights and rule-based governance (CPIA)1998. David Dollar et al.
	Law and Order Tradition (ICRG)	Average 1984-1998. (scale 0-6, Lower point totals indicate higher risk)
	Quality of the Bureaucracy (ICRG)	Average 1984-1998. (scale 0-6, Lower point totals indicate higher risk)
	Political rights (Freedom House)	Average 1972-1998. (scale 1-7, 1 represents most free)

	Civil Liberties (Freedom House)	Average 1972-1998. (scale 1-7, 1 represents most free)
	Voice and Accountability	Kaufmann, Kraay and Zoido-Lobaton (1999a).
	Political Instability and Violence	Kaufmann, Kraay and Zoido-Lobaton (1999a).
	Government Effectiveness	Kaufmann, Kraay and Zoido-Lobaton (1999a).
	Regulatory Burden	Kaufmann, Kraay and Zoido-Lobaton (1999a).
	Rule of Law	Kaufmann, Kraay and Zoido-Lobaton (1999a).
	Graft	Kaufmann, Kraay and Zoido-Lobaton (1999a).
Determinants of growth	The host of Barro-type x-country variables	
	Openness	The openness measure … Sachs and Warner (1995)