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Natural Resource Endowment:  
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# Natural Resource Endowment: A Mixed Blessing?

## Abstract

This paper deals with the implications of natural resources for the conduct of economic policies and the role and design of institutions in resource-rich countries. The paper briefly reviews the experience of a few resource-rich countries, highlighting the successes of those that have done well as well as some of the fiscal, monetary, and exchange rate policy issues that arise along the way. Special attention is given to Norway, the world's third largest oil exporter, and the role of good governance, including democracy. The paper then turns from anecdotal to econometric analysis by offering a quick glance at some of the empirical cross-country patterns that can be brought to bear on the relationship between natural resources, economic growth, and some of the main determinants of growth, including democracy.

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Keywords: economic growth, natural resources, governance.

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## 1. Introduction

Economic geography is no longer what it used to be. For a long time, economic geographers studied raw materials and their distribution around the world and assigned a crucial role to natural resource wealth and raw materials, their ownership, and trade routes. Ownership of those important resources tended to be equated with economic and political strength. The European powers' scramble for Africa from 1881 onward – this was when France occupied Tunis with Germany's consent – was mainly a scramble for the great continent's resources. The slave trade from the mid-15<sup>th</sup> century onward can be viewed the same way.

It did not take long to become clear that natural resources do not always confer widely shared benefits on the peoples who own them. Even after the end of colonial rule in Africa and elsewhere, many resource-abundant countries – Congo is a case in point – remained in dire straits. Some other countries – Nigeria, for example – that discovered their natural resources after independence also did not make rapid economic progress for reasons that seem to be related in part to poor management of their natural resources. Russia's former President, now Prime Minister Vladimir Putin has said: "Our country is rich, but our people are poor." Even so, some natural resource rich countries have made impressive progress. Botswana, Chile, and Mauritius will be singled out in what follows. And several resource-poor countries managed to become rich, including Hong Kong, Japan, and Singapore.

In the light of experience, the new economic geography puts relatively less emphasis on natural resources by recognizing several distinct sources of wealth, especially the accumulation of human and social capital. There are many different kinds of man-made capital, and, accordingly, many separate sources of economic growth which the people and their governments can bring under their control. By social capital is meant the quality of formal and informal institutions, including governance, transparency, and trust.

In the world as a whole, natural capital constituted a small part of total national wealth in 2005, or six per cent.<sup>1</sup> If intangible capital – that is, human and social capital – is left out of the computation, natural capital constitutes 26 per cent of total tangible capital around the world. Tangible capital comprises produced capital, urban land, natural capital, and net foreign assets. For comparison, sub-Saharan Africa's natural capital amounts to 28 per cent of the continent's total wealth and 70 per cent of its total tangible capital (Figures 1 and 2).

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<sup>1</sup> *The Wealth of Nations*, The World Bank (2010).

In the Middle East, the numbers are 34 per cent and 58 per cent, respectively.

In his memoirs, Lee Kuan Yew, the founding father of Singapore (1959-1991), described his thinking as follows:

I thought then that wealth depended mainly on the possession of territory and natural resources, whether fertile land ..., or valuable minerals, or oil and gas. It was only after I had been in office for some years that I recognized ... that the decisive factors were the people, their natural abilities, education and training.<sup>2</sup>

Earlier, in 1966, Prime Minister Lee had this to say in a speech at the Delegates' Conference of the National Trade Union Congress in Singapore:<sup>3</sup>

In the last 20 or more years since the end of the Second World War, we have seen how the human factor has been one of the most potent factors for economic growth and national recovery as against the natural geographic and mineral resources of a given society. Two nations, Germany and Japan, were both beaten down to their knees. Both lost large tracks of territory ... Both found their smaller remaining territories crammed with refugees ... And, in both cases, they were able to recover through an ability to mobilize their human resources. First, there was the basic willingness of the worker to work and pay for what he wants; and second, high standards of technical expertise and American markets and investments. But the latter were not decisive. The decisive factor was the human resources at their disposal. And Germany and Japan have emerged with a strength to be reckoned with in Europe and in Asia.

Recent economic growth theory suggests the interaction of several sources of economic growth and development as important to growth. For example, the conversion of natural capital to human and social capital to boost growth requires, or is at least helped by, good institutions and governance. For another example, investments in human capital and social capital tend to go hand in hand and reinforce one another. Here two types of classification can be helpful.

First, growth can be *extensive*, driven forward by the accumulation of capital, or it can be

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<sup>2</sup> Quoted from Lee Kuan Yew (1998), *The Singapore Story, Memoirs of Lee Kuan Yew*, Singapore Press Holdings, Singapore.

<sup>3</sup> Source: <http://stars.nhb.gov.sg/stars/tmp/lky19661002.pdf>, pp. 3-4.

*intensive*, springing from more efficient use of existing capital and other resources. Among the numerous alternative ways of promoting economic and social efficiency, one of the most effective is the accumulation of human capital through education, on-the-job training, and health care. There are many other ways as well to increase efficiency and economic growth. For instance, free trade can empower individuals, firms, and countries to break outside the confines of their production frontiers that, under autarky, would entail lower standards of life. Other examples abound, as the burgeoning economic growth literature of recent years has made clear. Moreover, it has come to be widely recognized that the quality of institutions and good governance can help generate sustained growth and so can also various other factors that are closely related to economic organization, institutions, and policy.<sup>4</sup> The determinants of growth are generally closely related and influence growth together as well as separately. In growth theory, everything depends on everything else.

A second classification distinguishes among several different types of capital that, like plants, are capable of growth at different rates:

- (i) Saving and investment to build up *real capital* – physical infrastructure, roads and bridges, factories, machinery, equipment, and such;
- (ii) Education, training, health care, and social security to build up *human capital*, a better and more productive work force;
- (iii) Exports and imports of goods, services, and capital to build up *foreign capital*, among other things, to supplement domestic capital;
- (iv) Democracy, freedom, equality, and honesty – that is, absence of corruption – to build up *social capital*, to strengthen the social fabric, the glue that helps hold the economic system together and keep it in good running order;
- (v) Economic stability with low inflation to build up *financial capital* – in other words, liquidity – that lubricates the wheels of the economic system and helps keep it running smoothly; and
- (vi) Manufacturing and service industries that permit diversification of the national economy away from excessive reliance on low-skill-intensive primary production, including agriculture, based on *natural capital*.

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<sup>4</sup> See Fischer and Sahay (2000), Campos and Coricelli (2002), and Acemoglu and Johnson (2005).

Most would accept that the six items on the list – real capital, human capital, foreign capital, social capital, financial capital, and natural capital – are desirable and helpful in themselves, and most would also agree on the desirability of diversification of economic activity. How these goals can be attained is another matter, however. The above list could be extended, but let us rather notice a couple of things about this short list.

First, capital appears in many different guises, some tangible, some not, but in all its guises it needs to be built up gradually through painstaking investments at the expense of current consumption. A strong capital base requires a lot of good and durable investments in different areas. Second, natural capital differs from the other kinds of capital on the list in that it may be a good idea – for reasons to be discussed below – to be on guard against excessive reliance on this particular kind of capital. Here it is important to distinguish clearly between natural resource abundance and natural resource dependence. By abundance is meant the amount of natural capital that a country has at its disposal: mineral deposits, oil fields, forests, farm land, and the like. By dependence is meant the extent to which the nation in question depends on these natural resources for its livelihood. Some countries with abundant natural resources, for example, Australia, Canada, and the United States, outgrew those resources and are no longer especially dependent on them. Other resource-abundant countries, for example, the Organization of Petroleum Exporting Countries (OPEC), do depend on their resources, some practically for all they have got. Still other countries, say, Chad and Mali, have few resources and yet depend on them for the bulk of their export earnings because they have little else to offer for sale abroad. Others still have few resources and do not depend in any important manner on the little they have, such as, for example, Jordan and Panama. The idea that diversification away from natural resources may be good for long-run growth centers on dependence rather than abundance even if the distinction may in some instances be hard to make in practice. It is quite conceivable that excessive dependence on a few natural resources may hurt economic growth, even if an abundance of natural resources, if well managed, may be good for growth. By contrast, no country has ever suffered from excessive reliance on human capital built up through education.

The rest of the paper is organized as follows. First, we consider the implications of natural resources for the conduct of economic policies and the role and design of institutions in resource rich countries. Second, we briefly review the experience of a dozen resource-rich countries, highlighting the successes of those that have done well, with special emphasis on

Norway, the world's third largest oil exporter. Third and last, we turn from story-telling to statistical analysis by offering a quick glance at some of the empirical cross-country evidence that can be brought to bear on the relationship between natural resources, economic growth, and some of the main determinants of growth.

## 2. Policy Issues in Natural Resource Rich Countries

This section addresses the three main areas for which the management of natural resources in resource-rich countries raises important issues: (i) fiscal policy, (ii) monetary, financial, and exchange-rate policy, with emphasis in both cases on the important role of institutions and governance, and (iii) the need for diversification away from excessive dependence on a few resources as well as away from narrowly based power elites. We begin with taxes.

### 2.1. Fiscal issues

"Taxes are what we pay for a civilized society," said the American justice Oliver W. Holmes. In general, however, taxes distort economic behavior. Therefore, it makes a substantial difference in economic terms how public revenue is raised to finance society's collective needs in addition to the efficiency with which the revenue is spent. The overall objective of tax policy ought to be the collection of enough revenue at the cost of as small distortions as possible. The worst possible way to collect revenue is to resort to the inflation tax, probably the least efficient and most harmful and distorting of all methods of taxation. Most other taxes have side effects that discourage households and firms from doing desirable things. Import tariffs impede foreign trade and thereby also economic efficiency and growth. Income taxes discourage work and market production. Sales taxes fall disproportionately on low-income households that spend most of their income on necessities and have little to save. Natural resource rich countries can to some extent avoid these problems because they possess a tax base that offers them an opportunity to gather public revenue at a minimal cost to efficiency through distortions. This is because the resources will stay put – they are there – and cannot move. This argument is akin to the old story that land taxes are more efficient than taxes on movable factors of production. But there is a difference, a big one. Natural resources belong to the people.

As a matter of near-universal principle, a people's right to its natural resources is a human right proclaimed in primary documents of international law and enshrined in many national



constitutions (Wenar, 2008). Thus, Article 1 of the International Covenant on Civil and Political Rights states that “All people may, for their own ends, freely dispose of their natural wealth and resources ...” The first article of the International Covenant on Economic, Social and Cultural Rights is identical. Except in the United States, where rights to oil resources were legally transferred to private companies, natural resources are as a rule common property resources. This means that, by law, the resource rents accrue in large part to the government. Hence, no taxation is really needed except as a formality. In any case, the word ‘tax’ would be inappropriate. Here ‘fee’ is a more fitting word because fees are typically levied in exchange for providing specific services such as a permission to utilize a common property resource. Therefore, resource taxes should rather be referred to as fees or resource depletion charges.<sup>5</sup> In any event, it is important to use the proceeds from resource fees either to finance socially productive expenditures or to reduce other less efficient sources of revenue to keep the overall tax burden manageable. Good fiscal governance requires careful attention to allocative and technical efficiency on both sides of the fiscal equation, public expenditures as well as revenue mobilization needed to finance those expenditures.

The legal aspect of natural resources as human rights has another important implication. The accrual of natural resource rents to the government presupposes representative democracy and, hence, as a matter of international law, the legitimacy of the government’s right to dispose of the resource rents on behalf of the people. This principle is, for instance, acknowledged in the Permanent Constitution of the State of Qatar, Article 1, which states: “Its political system is democratic.” Further, Article 29 states: “Natural wealth and its resources are the property of the State; and the State shall preserve and exploit the same in the best manner in accordance with the provisions of the law.” For another example, the Iraqi constitution of 2005 proclaims in Article 108 that “Oil and gas are the property of the Iraqi people in all the regions and provinces.” Again, by international law, this proclamation presupposes political diversification through representative democracy. In the same spirit, the preamble to the Algeria Constitution refers to the “recovery of the national resources and the building of a State exclusively for the benefit of the people.”

Fish is not oil, but Iceland’s fisheries policy sheds light on these issues. Iceland’s system of catch quotas, in operation since 1984, shares the main features of the European Union’s Common Fisheries Policy in that the Fisheries Minister sets annual quotas for each species

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<sup>5</sup> See Gylfason and Weitzman (2003).

and allocates them free of charge to boat owners based on their catches in 1981-83. The boat owners can then either fill their quotas at sea or sell them, as many have done, thereby reducing the amount of capital tied up in the fishing industry and pocketing the rents. As a matter of fact, the law stipulating gratis allocation of the quotas to the boat owners was drafted at the offices of The Federation of Icelandic Fishing Vessel Owners. Free trade in quotas enhances efficiency by facilitating a transfer of quotas at market price from less efficient firms to more efficient ones. But to be fair and fully efficient, free trade in quotas presupposes that the initial allocation was fair and efficient, that is, that the quotas were sold at fair market value by their rightful owner, the State on behalf of the Icelandic people, to whom Iceland's fish resources belong by law as well as by the International Covenant on Civil and Political Rights as mentioned before.<sup>6</sup> The macroeconomic significance of the fishing rents in Iceland is such that auctioning off the quotas from the outset rather than giving them away for free and thus prolonging huge overcapacity and inefficiency in the fishing industry could at the time have generated enough revenue to finance the abolition of the personal income tax in Iceland.<sup>7</sup> This opportunity to replace inefficient income taxation by distortion-free fishing fees was missed. Alfred Pigou would also have been disappointed. Fishing fees are an example of a Pigovian tax or fee by which is meant a levy on a market activity that generates negative externalities. Another example of a Pigovian levy is "taxation" of oil and gas, whether at source or at the pump. What oil and fish have in common is the tendency to excess characteristic of the use of common property resources: there is too much fishing going on, thereby endangering fish stocks around the world, and we drive too much, thereby producing congestion that imposes delays on other travelers.

Iceland's failure to make the boat owners pay for the quotas had consequences. It created with the stroke of a pen a wealthy class of individuals who went on to become major players in the political arena to make sure that their privileges would not be revoked by new legislation. The stories are legend. Their latest move was to buy the country's second largest newspaper and install as editor the discredited Central Bank governor who presided over Iceland's fateful banking crash of 2008 which wiped out financial assets equivalent to seven

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<sup>6</sup> In 2007, the United Nations Committee on Human Rights declared that the Icelandic quota system constitutes a violation of human rights and instructed the Icelandic government to rectify the fisheries management system by removing the discriminatory element from the system. See [International covenant on civil and political rights](#), CCPR/C/91/D/1306/2004, 14 December 2007.

<sup>7</sup> The natural resource rent from the fisheries has been estimated to amount in long-run equilibrium to about five per cent of Iceland's gross domestic product (GDP).

times the country's GDP, a unique event in the financial history of the world. The failure to sell fishing quotas or auction them off rather than hand them out for free can be viewed as part of the lead-up to Iceland's more recent banking fiasco. For how would politicians who got away with handing out for free hugely valuable catch quotas go about privatizing state banks? They would apply the same method again, and they did. They sold two of the three largest banks in Iceland at a modest price to political cronies who ran them to the ground within six short years. The government set up a Special Investigation Commission which has directed a number of cases involving the banks to the Special Prosecutor's Office set up specifically to investigate possible violations of the law by the banks and others.

Let us move on. Because their prices tend to be volatile, abundant natural resources tend to go hand in hand with fluctuations in export revenues. Such volatility calls for fiscal stabilization. This problem raises the classic question of rules versus discretion. Discretionary stabilization measures aimed at building up foreign exchange reserves and fiscal revenues when commodity prices are high and using up reserves and revenues when prices are low can be criticized on the grounds that they tend to kick in too late and thus to become counterproductive, exacerbating the volatility of earnings. Fiscal rules, on the other hand, can be faulted for being too mechanical and insensitive to circumstances. This is a classic dilemma to which a one-size-fits-all solution does not exist.

Chile applies a fiscal rule by which the government can run a deficit larger than the target of zero, or one per cent surplus relative to GDP, insofar as GDP falls short of potential or the price of copper is below its medium-term (10-year) equilibrium level (Frankel, 2010). The aim of the scheme is to shield producers – and the national economy – from price fluctuations. This makes the scheme subject to similar reservations as price stabilization funds and, more generally, rules-based stabilization policies. The scheme has both pros and cons. A novel aspect of the Chilean scheme is that two panels of experts determine the output gap and the medium-term equilibrium price of copper to reduce the risk of short-sighted political interference.

Likewise, in Iceland it has been suggested, among other proposals to allow the resource rent to accrue to its rightful owner, that an 'Open Market Fisheries Committee' be set up and vested with a broad mandate and broad powers to set market-based fishing fees to

maximize the long-run profitability of fisheries for the benefit of the sole national owner.<sup>8</sup> The idea is that the setting of fisheries management instrument values, including fees, is too important a task to be left, ultimately, in the hands of a politically appointed minister, no matter how capable or well intentioned the currently appointed individual happens to be. The fisheries authorities should be above even the hint of suspicion of manipulation. There needs to be clear and specific management and accountability structure, formalized in the national interest by the reform legislation. This is the idea behind independent yet accountable Central Banks as well as, of course, behind independent judiciaries and supervisory authorities. The idea is applicable across a broad range of natural resources.

## **2.2. Monetary policy, finance, and exchange rates**

Several monetary policy issues arise in connection with natural resource management. Perhaps the most important one has to do with the Dutch disease, so named for triggering fears of de-industrialization in the Netherlands following the appreciation of the Dutch guilder after the discovery of natural gas deposits in the North Sea around 1960 (Figure 3). In fact, the Dutch got over the ailment fairly quickly and have seen their exports and imports rise rapidly relative to GDP. As it turned out, gas exports did not crowd out other exports. So, the Dutch part of the term proved to be a misnomer. How about the disease part? This remains a matter of some controversy. Some observers view the dislocations due to high currency values simply as a matter of one sector's benefiting at the expense of others, without seeing any macroeconomic or social damage done. Others view the Dutch disease as such, pointing to the potentially harmful consequences of the resulting reallocation of resources – from high-tech, high-skill intensive service industries to low-tech, low-skill intensive primary production, for example – for economic growth and diversification. Clearly, an overvalued of currency hurts exports and import-competing industries. This is one of the most robust empirical relationships in international economics. The reverse of this phenomenon has been on display for some time in China where the undervaluation of the renminbi continues to boost Chinese exports and import-competing industries to the consternation of some of China's trading partners. The point is a simple one: if overvaluation

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<sup>8</sup> See Gylfason and Weitzman (2003).

hurts trade and growth as has been known for a long time, then undervaluation must likewise help trade and growth.<sup>9</sup>

Norway's total exports have been stagnant in proportion to GDP since before the oil discoveries around 1970. This means that oil exports have crowded out nonoil exports one-for-one relative to GDP. Norway has no high-tech companies that compare with Sweden's LM Ericsson, Finland's Nokia, or Denmark's Bang and Olufsen. Yet another sign of a tendency, albeit a weak one, to the Dutch disease is, perhaps, Norway's unwillingness – almost unique in Europe – to join the European Union. This lack of interest is based in part on the popular belief that Norway's oil wealth has reduced the country's need for the benefits of European Union membership. Even so, Norway has proved very good at keeping inflation down to resist overvaluation of the currency. Sustained price stability requires good monetary governance through independent yet accountable central banks. Likewise, a healthy financial sector development requires good monetary governance, including credibility and transparency. A lack of transparency seems to have played a role in the financial crisis that began in the United States in 2007.

The volatility of commodity prices poses not only a challenge for fiscal policy but also monetary policy by leading to volatility in exchange rates, export earnings, output, and employment. Experience shows that volatility can be detrimental to investment and growth.<sup>10</sup> Exchange rate volatility is no exception. This is one reason why natural resource rich countries are prone to sluggish investment and slow growth. With this in mind as well as the resounding success of the euro since its launch in 1999, more and more countries in Africa and around the world have plans to pool their currencies to foster economic stability and growth. This is the surest albeit not risk-free way to use monetary policy to avoid overvaluation and excessive volatility of the currency. To paraphrase Winston Churchill's comment about democracy: the best way to preserve the integrity of the national currency is to abolish it – or, more precisely, share it with others.

The build-up of natural resource funds such as Algeria's Fund for the Regulation of Receipts (FRR) and other sovereign wealth funds raises a number of issues. With petroleum and natural gas providing Algeria with almost two-thirds of government income, more than a third of GDP, and 95 per cent of export earnings, the stabilization fund was set up in 2000 to

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<sup>9</sup> See Eichengreen (2008).

<sup>10</sup> See Aghion and Banerjee (2005).

insulate the Algerian economy from volatility in gas and oil commodity prices. Several other countries have a similar setup. And they all have a choice between regarding the fund either as part of the government's fiscal chest available for current use or as a reserve for the future subject to strict rules about its planned disposal. After a few years of experimenting, Norway decided to place itself firmly at one end of the spectrum, having in recent years invested virtually all its oil revenues in foreign securities and set them aside in a pension fund for future use. Low- and middle-income countries have more pressing current needs and, for that reason, may find the Norwegian method impractical. Even so, they could benefit from trying to depoliticize the use of natural resource revenues by vesting their disposal in an independent authority set up along the lines of independent yet accountable central banks, judiciaries, and supervisory authorities. Understandably, easy revenues from natural resources are especially tempting in the eyes of politicians in urgent need of public support. Therefore, prudence calls for firewalls to be erected between sovereign wealth funds and the heat of the day-to-day political process. This is a question of checks and balances, of finding ways to reduce the risk that natural resource revenues are misspent or even squandered for short-term political gain.

The underlying issue here is the risk of rent seeking, especially in conjunction with ill-defined property rights, imperfect or missing markets, and lax legal structures. The problem with rent seeking, apart from the injustices it tends to produce, is that it tends also to divert productive efforts and resources away from more socially fruitful economic activity. Without adequate checks and balances, even full-fledged democracies can suffer from this problem as the afore-mentioned story of Iceland's fisheries policy demonstrates. Less democratic countries appear to be even more prone to this risk. This is why important international initiatives have recently been taken to encourage increased transparency in the use of natural resource revenues. The Extractive Industries Transparency Initiative (EITI) aims to set a global standard for transparency in oil, gas, and mining.<sup>11</sup> The Natural Resource Charter (NRC) lays out "a set of principles for governments and societies on how to best manage the opportunities created by natural resources for development."<sup>12</sup> The Revenue Watch Institute (RWI) promotes the responsible management of oil, gas, and mineral resources for

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<sup>11</sup> See <http://eiti.org/>.

<sup>12</sup> See <http://www.naturalresourcecharter.org/>.

the public good.<sup>13</sup> Put bluntly, open access to other people's money tends to breed carelessness as well as a false sense of security that may lead to the sentiment that anything goes, resulting in the neglect of many of the things that make countries grow, including education and institutions. This is the sense in which, if it is not well managed, natural capital may tend to crowd out other types of capital.

The question of other people's money raises yet another legal issue. The managers of sovereign wealth funds are not necessarily free to manage the funds entirely as they see fit if their guidelines and rules do not fully comply with international or local laws. Because the legal issues raised by Wenar (2008) are new to most economists and policy makers, it is not clear that these guidelines and rules were always designed to be waterproof. To illustrate the point, Wenar tells the story of Equatorial Guinea where the oil export boom after 1990 has produced immense but highly concentrated private wealth amid public squalor, even if the oil wealth belongs to the people by Article 1 of the International Covenant on Civil and Political Rights which Equatorial Guinea has signed. Another example may be instructive, from Iceland, where boat owners used their fishing quotas as collateral for their private debts that, for some, proved crushing.<sup>14</sup> This meant that, in some cases, the quotas wound up in the hands of the boat owners' banks' foreign creditors even if Icelandic law clearly states that foreign owners of Icelandic catch quotas cannot hold onto them and must return them to Icelandic hands within a year. It is unclear whether the foreign creditors were aware of this legal stipulation when they extended, via Icelandic banks, their loans to the fishing firms in question with quotas as collateral. Besides, the rightful original owner of the quotas, the Icelandic people, was never paid. This legal aspect of Iceland's ongoing financial crisis remains unresolved. There may be lessons here for other nations.

### **2.3. Double diversification**

Economic diversification encourages growth by attracting economic activity from excessive reliance on primary production in agriculture or a few natural-resource-based industries, thus facilitating the transfer of labor from low-paying jobs in low-skill-intensive farming or mining to more lucrative jobs in more high-skill-intensive occupations. Political diversification encourages growth in a similar way by redistributing political power from

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<sup>13</sup> See <http://www.revenuewatch.org/about-rwi>.

<sup>14</sup> The overall debts of Iceland's fishing firms are at present equivalent to about a third of their annual earnings.

narrowly based ruling elites to the people, thus in many cases replacing an extended monopoly of sometimes ill-gotten power by democracy and pluralism. The essence of the argument is the same in both cases: diversity pays.

Modern mixed economies need a broad base of manufacturing, trade, and services to be able to offer the people a steadily improving standard of life. Therefore, they need to find ways of diversifying their economic activity away from once-dominant agriculture that tends to perpetuate poverty and similarly away from too much dependence on a few natural resources that tend to stifle or delay the development of modern manufacturing and services. To function well, national economies also need broad political participation and a broad base of power in order to be able to offer the citizenry an efficient and fair way of exercising its political will and civil rights through free assembly, free elections, and such. Without political democracy, bad governments tend to last too long and do too much damage. The need for diversification is especially urgent in resource-rich countries because they often face a double jeopardy – that is, natural resource wealth that is concentrated in the hands of relatively small groups that seek to preserve their own privileges by standing in the way of both economic and political diversification that would disperse their power and wealth. Rent seekers typically resist reforms – economic diversification as well as democracy – that would redistribute the rents to their rightful owners.<sup>15</sup>

While diversification is a widely shared goal, it is not obvious how it can be achieved. But some guidelines can be offered. First, avoiding overvaluation of the currency is important because an overvalued currency punishes export industries specializing in manufacturing and services and also import-competing industries. It takes strong discipline to resist the temptation to allow the currency to appreciate above its appropriate level because of the politically popular benefits that accrue from cheap foreign exchange to both households and firms that depend on imported inputs. We have here, in second place, yet another reason why independent but accountable central banks, immune by law from political pressures, are so important. Monetary policy is now widely considered to be too important to be left to impatient politicians, which is why central banks in many countries have been granted greater independence from political authority to pursue as they see fit the monetary policy objectives – almost invariably, low inflation – laid down by the government.

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<sup>15</sup> See Auty (2001) and Ross (2001).



The same argument can be applied at least to the stabilization function of fiscal policy as well as to those aspects of fiscal policy that have to do with the disposal of natural resource rents and such as mentioned before, but not, of course, to fiscal policy across the board because government expenditure and revenue decisions are inherently political in their nature and cannot, therefore, and must not in a democracy be separated from the political process. Other institutions, such as supervisory authorities that monitor banks and financial markets and, where such offices exist, monitor the management of natural resource rents also need protection through statutory independence from political authorities. Good governance requires institutional design that assures effective checks and balances. Transparency is a prerequisite for good governance. Sweden takes transparency seriously, even in its constitution that consists of four fundamental laws, including the Freedom of the Press Act and the Fundamental Law on Freedom of Expression. Transparency needs to go hand in hand with accountability and with confidentiality where appropriate, including protection for whistle blowers. In this regard, the Extractive Industries Transparency Initiative, The Revenue Watch Institute, and the Natural Resource Charter have a potentially helpful contribution to make, like Transparency International. Those international efforts deserve to be supplemented by civil society in individual countries, especially those that are prone to the problems that often accompany an abundance of natural resources.

Third, more and better education at all levels of schooling is conducive to diversification because a good education attracts workers to well-paying jobs in services and manufacturing. Education and diversification go hand in hand. In sub-Saharan Africa the share of services in GDP went up from 46 per cent in 1965 to 54 per cent in 2008 while in North Africa and the Middle East the services share contracted from 48 per cent to 46 per cent. By comparison, the high-income countries saw the share of services in GDP expand from 55 per cent in 1970 to 73 per cent in 2007.<sup>16</sup> The new industrial state has become the new services state.

How much government involvement is necessary for diversification? The government plays a key role in education at all levels. Increased school enrollment at the secondary level as well as at colleges and universities would help besides being desirable in its own right. For the graduates to be able to find jobs, the government must also see to it that the exchange rate of the currency is compatible with profitable manufacturing and services exports.

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<sup>16</sup> Source: *World Development Indicators*, World Bank, 2010.

Otherwise, young people will not be motivated to educate themselves.<sup>17</sup> Furthermore, the government needs to foster a business-friendly climate that makes it easy to set up new firms. The World Bank's annual Ease of Doing Business ranking is instructive in this regard.<sup>18</sup> The index reflects how easy it is to start a business, deal with construction permits, employ workers, register property, get credit, protect investors, pay taxes, trade across borders, enforce contracts, and close a business. In the current ranking (2010), Singapore is ranked first out of 183 countries, followed by New Zealand, and Hong Kong SAR, China. Those three are followed by the United States and the United Kingdom in fourth and fifth place. The top oil producers on the list are Norway in tenth place and Saudi Arabia in 13<sup>th</sup> place.

Does industrial policy have a role to play in promoting diversification? Rodrik (2004) reviews the pros and cons. First, while it is often claimed that governments cannot pick winners, the inability to pick winners needs to be weighed against the ability to cut losses once mistakes have been made. Second, it has been said that developing countries lack the competent civil service needed to make industrial policy work, but most countries do have or can build pockets of bureaucratic excellence. Third, industrial policy interventions are prone to political capture and corruption. This risk, however, is not confined to industrial policy, but is present also in other spheres of public policy, including privatization. Fourth, different observers read the empirical evidence differently. Some claim that there is little evidence that industrial policy has worked in the past except in South Korea, while others, including Rodrik (2004), recount several success stories in Latin America and elsewhere around the developing world. In Chile, for instance, the government encouraged a transfer of resources from mining, forestry, fishing, and agriculture to aluminum smelting, salmon farming, and wine production. Fifth, some hold the view that support for research and development as well as intellectual protection would be more effective than industrial policy, while others believe, on Pigovian grounds, that the government needs to support entrepreneurship in new activities with high social returns and low private returns. Sixth, some claim that international rules no longer leave much scope for industrial policy interventions, while others see plenty of scope. In general, it seems to be a good idea to encourage new industries in line with the country's comparative advantages and available expertise in public administration and to follow the market rather than try to take the lead.

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<sup>17</sup> See Pritchett (2006).

<sup>18</sup> <http://www.doingbusiness.org/Rankings>.

Even so, there are no easy solutions. Rodrik (2004, p. 3) advocates “strategic collaboration between the private sector and the government with the aim of uncovering where the most significant obstacles to restructuring lie and what type of interventions are most likely to remove them.” Policy experiments need to be based on general principles and, at the same time, tailored to local circumstances. There is no such thing as a one-size-fits-all industrial policy, and never was.

### 3. Norway and Other Success Stories

#### 3.1. Norway and oil

Norway, of course, always had its natural resources. But it was only with the advent of educated labor that it became possible for the Norwegians to harness those resources on a significant scale. Human capital accumulation was the primary force behind the economic transformation of Norway. Natural capital was secondary. The World Bank attributes 62 per cent of Norway’s national wealth to intangible capital, including human capital, 21 per cent to produced capital and urban land, and 13 per cent to natural capital; the remaining four per cent share is net foreign assets.<sup>19</sup> Today, earnings from oil constitute a quarter of Norway’s GDP and investment, a third of its budget revenues, and a half of export earnings. Norway’s Petroleum Fund, established in 1990 and now named Government Pension Fund to reflect its intended use, will before long amount to USD 100,000 per person, or almost two times Norway’s purchasing-power-parity-adjusted per capita GDP. It is invested entirely in foreign securities, currently 60 per cent in equities and 40 per cent in fixed-income securities.

Norway’s fiscal policy and its management of its oil wealth have played an important role in stabilizing the local economy. Before, a variable but declining proportion of each year’s net oil-tax revenue was transferred to the government budget, essentially to cover the non-oil budget deficit. However, as the relative importance of the petroleum sector declines, the share of petroleum revenues directed to covering budget deficits will naturally tend to rise. Even so, the domestic economy has been largely shielded from the influx of oil money, thereby avoiding overheating and keeping the value of the Norwegian krone from rising. This deliberate strategy averted the damage to nonoil exports and import-competing industries

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<sup>19</sup> Source: *The Wealth of Nations*, The World Bank (2010).

that would have resulted from a more marked appreciation of the krone in real terms, or at least limited the damage. Low inflation in Norway reflects the government's disciplined fiscal and monetary policy stance and, in particular, its resistance to the temptation to channel the country's oil wealth to current uses on a large scale in the face of loud calls for using more of the oil revenue to address domestic social needs rather than continue to build up the Government Pension Fund.

Norway's sensible approach to oil wealth management deserves the attention it has received in other resource-rich countries around the world. Norway's approach has several key features:

- (i) From the beginning, before the first drop of oil emerged, the oil and gas reserves within Norwegian jurisdiction were defined by law as common property resources, thereby clearly establishing the legal rights of the Norwegian people to the resource rents;
- (ii) On this legal basis, the government has absorbed about 80 per cent of the resource rent over the years, having learnt the hard way in the 1970s to use a relatively small portion of the total to meet current fiscal needs, instead setting most of its oil revenue aside in the state Petroleum Fund, now Pension Fund;
- (iii) Further to the preventive legislation passed at the outset, the government laid down economic as well as ethical principles ('commandments') to guide the use and exploitation of the oil and gas for the benefit of current and future generations of Norwegians;
- (iv) The traditional main political parties have from the beginning shared an understanding of the need to shield the national economy from an excessive influx of oil money to avoid overheating and waste, a view not shared by the Progress Party (est. 1973); and
- (v) The Central Bank (Norges Bank), which, with the adoption of inflation targeting in 2001 embarked on a course toward increased independence from the government, manages the fund on behalf of the Ministry of Finance, maintaining a distance between politicians and the fund that has grown to around USD 450 billion (USD 94,000 per person in Norway in 2009).

By Norwegian law, in keeping with the International Covenant on Civil and Political Rights, the oil wealth belongs to the state. The petroleum industry extracts oil and gas on public land albeit offshore. In principle, all the rent from oil and gas should accrue to the Norwegian people through their government. The state's title to these resources constitutes the legal basis for government regulation of the petroleum sector as well as for its taxation. Exploration and production licenses are awarded for a small fee to domestic and foreign oil companies alike. The Norwegian government expropriates the oil and gas rent through taxes and fees as well as direct involvement in the development of the resources rather than through sales or auctioning of exploration and production rights.

For all these reasons, Norway was able to avoid rent seeking and related problems that have afflicted other oil exporting countries – Iran, Libya, Mexico, Nigeria, Russia, Saudi Arabia, Sudan, Venezuela, and others. Figure 4 shows how Norway and Saudi Arabia grew apart after the mid-1980s when the two countries had a similar per capita GDP. Economic indicators do not do full justice, however, to the impressive progress made by Algeria and Saudi Arabia where, since 1960, life expectancy has increased by no less than 25 years and 27 years, respectively, compared with seven years in Norway. All things considered, what sets Norway apart is that Norway was a well-functioning, full-fledged democracy long before its oil discoveries. Democrats are less likely than dictators to try to grab resources to consolidate their political power.<sup>20</sup> In several other countries, point resources such as oil and minerals have proved particularly “lootable,” though not in Botswana to which we now turn.

### **3.2. Botswana, Chile, and Mauritius**

At independence in 1966 Botswana started out with 12 kilometers of paved roads, 22 college graduates, and 100 secondary-school graduates.<sup>21</sup> Diamonds were discovered the following year, in 1967, and now provide tax revenue equivalent to a third of GDP. Botswana has managed its diamond mining quite well and used the rents to support rapid growth that has made Botswana the most prosperous country in mainland Africa, having surpassed South Africa a few years ago in terms of purchasing-power-parity-adjusted per capita gross national income (GNI).<sup>22</sup> In Botswana, gross secondary-school enrolment rose from 19 per

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<sup>20</sup> See Mehlum, Moene, and Torvik (2006).

<sup>21</sup> See Acemoglu, Johnson, and Robinson (2003).

<sup>22</sup> Source: *World Development Indicators* (2010), World Bank, Washington, DC.

cent of each cohort in 1980 to 80 per cent in 2006 compared with an increase from 50 per cent to 89 per cent in Mauritius over the same period. Between 1980 and 2007, Botswana increased its public expenditure on education from 6 per cent of GDP to 8 per cent compared with 4 per cent in Mauritius.

Unlike Sierra Leone's alluvial diamonds that are easy to mine by shovel and pan and easy to loot, Botswana's kimberlite diamonds lie deep in the ground and can only be mined with large hydraulic shovels and other sophisticated equipment and, therefore, are not very lootable.<sup>23</sup> This difference probably helped Botswana succeed while Sierra Leone failed, and so, most likely, did South African involvement – that of De Beers, in particular – in the Botswanian diamond industry. True, with a Gini coefficient of 60 according to the UNDP,<sup>24</sup> Botswana has one of the world's least equal distributions of income and a correspondingly high poverty rate. Even so, by and large, Botswana has enjoyed remarkable economic success accompanied by political stability and a steady advance of democracy (Figure 5). With low inflation, albeit slightly higher at ten per cent per year on average 1966-2008 than in sub-Saharan Africa as a whole, good policies no doubt contributed to this outcome. So did good institutions. The corruption perceptions index of Transparency International for 2009 ranks Botswana higher than all other African countries, assigning it 37<sup>th</sup> place in a group of 180 countries.<sup>25</sup> The Ibrahim Index of African governance 2010 puts Botswana in third place out of 53, just behind Mauritius and the Seychelles.<sup>26</sup> The World Bank's Ease of Doing Business index for 2010 has Botswana in 45<sup>th</sup> place out of 183, behind Mauritius (17) and South Africa (34) and ahead of all other African countries as well as, for example, Chile (49) and Peru (56). Tragically, due to the HIV/Aids epidemic, Botswana's remarkable economic achievements have been accompanied by only a modest increase in life expectancy by four years since 1960 compared with longer lives by 14 years in Sierra Leone and six years in Congo Democratic Republic (Figure 5).

Unlike Botswana, Mauritius made a deliberate and successful effort to reduce its reliance on its main export commodity, sugar. This was done through good policies and good institutions, emphasizing foreign trade through diplomacy and other means as well as education. The share of manufactures in merchandise exports increased from two per cent

<sup>23</sup> See Olsson (2006) and Boschini, Petterson, and Roine (2007).

<sup>24</sup> See <http://hdrstats.undp.org/indicators/147.html>.

<sup>25</sup> See [http://www.transparency.org/policy\\_research/surveys\\_indices/cpi/2009/cpi\\_2009\\_table](http://www.transparency.org/policy_research/surveys_indices/cpi/2009/cpi_2009_table).

<sup>26</sup> See <http://www.moibrahimfoundation.org/en/section/the-ibrahim-index>.

in 1970 to 57 per cent in 2008. Even so, sugarcane remains the dominant crop, generating 25 per cent of export earnings. Since the mid-1970s, total exports have hovered around 50 per cent to 60 per cent of GDP like in Botswana. These are high ratios by African and international standards, even for small countries with populations below two million. During 1977-2008, inflation was kept below nine per cent per year on average. During the same period, investment in Mauritius amounted to 26 per cent of GDP against 32 per cent in Botswana. Life expectancy at birth in Mauritius has increased by 13 years since 1960 as in Fiji, another sugar exporter, while Costa Ricans have added 17 years to their average life expectancy (Figure 6).

Thus, like Botswana, Mauritius did many things right. Beyond the usual suspected determinants of growth that Mauritius got right, including education, exports, and investment, Frankel (2010) suggests that the cosmopolitan nature and origin of the population of Mauritius contributed to the island's successful, harmonious, and democratic development by creating a balance between ethnic groups like in Singapore, Honk Kong SAR, China, and Dubai. Frankel points out that the three African countries with the highest governance rankings (Mauritius, Seychelles, and Cape Verde) are all small islands that had no indigenous population, suggesting that it helps that everyone came from somewhere else like in the United States – except, of course, for the Indians.

Figure 7 shows the development of real per capita GDP and democracy in Chile, Peru, and Zambia. Zambia failed to grow despite its considerable copper deposits but has all the same made commendable albeit somewhat uneven progress on the democracy front. The rapid growth of Chile and Peru has gone hand in hand with much longer lives by 22 years and 26 years, respectively, while life expectancy at birth in Zambia has stood still at 45 years since 1960. Since its return to democracy in 1988, Chile has made rapid progress and become a fully fledged democracy and member of the OECD, tripling its real per capita GDP since the 1980s. Chile has opened up to trade: exports of goods and services increased from 13 per cent of GDP in 1960 to 45 per cent in 2008. By contrast, Zambia, also a major copper exporter, saw its exports plunge from 60 per cent of GDP at independence in 1964 to 37 per cent in 2008. Even so, manufactures accounted for only 12 per cent of Chile's total merchandize exports in 2008 compared with 16 per cent in Peru, to name another major copper exporter, and seven per cent in Zambia. Chile now sends 84 per cent of its young people to secondary school compared with 98 per cent in Peru and 52 per cent in Zambia.

Inflation is a thing of the past in Chile while Zambia has grappled with double-digit inflation or worse most of the time since independence. So, Chile also fits into the general picture: exports, education, investment, and price stability are good for growth, especially when encouraged by good governance, including democracy.

#### 4. From Anecdotes to Empirical Testing

The time has now come to turn from story-telling to statistical analysis. This section presents a series of growth regression estimates for 164 countries during 1960-2000.<sup>27</sup> The strategy will be to regress the rate of growth of per capita GDP during this 40-year period on the share of natural capital in total wealth, defined as in Figure 2, and then to add to the regression model other potential determinants of growth representing aspects of other types of capital in order to assess the robustness of the initial result – that is, to see if natural capital survives the introduction of additional explanatory variables that are commonly used in empirical growth research. As we add more independent variables, the number of observations drops gradually from 164 to 90 due to missing data. No outliers will be excluded. The estimation method is ordinary least squares (OLS); however, the final benchmark model will also be estimated as a system by the seemingly unrelated regression (SUR) method to demonstrate that the SUR results are essentially the same as the OLS results. This may suggest that, as an empirical matter, the endogeneity of several of the explanatory variables in the growth equations is not, quantitatively speaking, a serious problem in this estimation exercise.

##### 4.1. Growth across countries

Table 1 presents the resulting sequence of regressions. An interpretation of the size and economic significance of the coefficients will be offered at the end of the journey. Model 1 describes a statistically significant inverse relationship between per capita growth and the logarithm of initial income (i.e., in 1960). This relationship reflects conditional convergence – the idea that rich countries grow less rapidly than poor ones because the rich have already exploited more of the growth opportunities available to them, by sending more young people to school, for instance. Initial income is defined as purchasing-power-parity-adjusted

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<sup>27</sup> This section draws on Gylfason (2008).



per capita GNI in 2000 divided by an appropriate growth factor to ensure consistency between our income measures in 1960 and 2000 and our measures of economic growth between those years. The coefficient on initial income is significantly negative as expected.

In Model 2, we add to the regression the World Bank's measure of the natural capital share in total wealth in the year 2000 (recall Figure 2), our proxy for natural resource dependence. An increase in the natural capital share reduces growth for given initial income. When natural capital per person, our proxy for natural resource abundance, is added to the regression in Model 3, we see that natural resource dependence continues to hurt growth as hypothesized, even if natural resource abundance has a positive effect on growth. Next, in Model 4, we add democracy as a proxy for one important aspect of social capital to the regression. The democracy variable is taken from the *Polity IV Project* at the University of Maryland.<sup>28</sup> The democracy variable is defined as the difference between an index of democracy that runs from zero in hard-core dictatorships to ten in fully fledged democracies and an index of autocracy that similarly runs from zero in democracies to ten in dictatorships. Each of the two components reflects various aspects of democratic rights and freedoms and is an average over the years 1960-2000. The composite democracy index used here spans the range from -10 to 10 (this is the polity2 index in the Polity IV data base). The democracy index is significantly correlated with the Ibrahim Index of African governance. The correlation between the average values of the two indices for 53 African countries during 2000-2008 is 0.41. Model 4 suggests that democracy is good for growth. All the preceding variables survive.

Model 5 shows that the log of the share of gross domestic investment in GDP makes a significant contribution to growth as expected. The logarithmic formulation is intended to capture decreasing returns to investment. In Model 6, we see how the log of the secondary-school enrolment rate, like investment, stimulates growth without displacing any of the variables inherited from the preceding models.

At last, in Model 7, we enter fertility measured by the number of births per woman into the regression to see if it matters for growth as suggested by the neoclassical growth model as well as by the idea that reduced fertility can be regarded as an alternative form of investment in human capital by making it possible for most parents to send relatively more of their children to school from small families than from large ones. We see that increased

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<sup>28</sup> See Marshall and Jagers (2001).

fertility reduces economic growth as expected, without reducing the statistical significance of the explanatory variables already included in the regression.

**Table 1. Regression results on natural capital and economic growth**

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Initial income	-0.738 (5.2)	-0.491 (3.1)	-0.955 (5.3)	-1.066 (5.2)	-1.237 (7.0)	-1.603 (7.8)	-1.702 (8.5)	-1.702 (8.9)
Natural capital share		-0.043 (5.3)	-0.059 (7.1)	-0.045 (4.7)	-0.043 (5.3)	-0.032 (4.0)	-0.025 (3.1)	-0.025 (3.3)
Natural capital per person			0.096 (4.5)	0.084 (3.7)	0.062 (3.3)	0.046 (2.5)	0.041 (2.3)	0.041 (2.4)
Democracy				0.071 (2.2)	0.073 (2.7)	0.073 (2.7)	0.054 (2.0)	0.054 (2.1)
Investment rate (log)					2.921 (6.8)	1.723 (3.2)	1.341 (2.5)	1.341 (2.6)
Secondary-school enrolment (log)						0.940 (4.0)	0.556 (2.1)	0.556 (2.2)
Fertility							-0.402 (2.8)	-0.402 (3.0)
Countries	164	125	124	113	113	90	90	90
Adjusted R <sup>2</sup>	0.14	0.18	0.29	0.27	0.48	0.55	0.58	0.58
Estimation method	OLS	OLS	OLS	OLS	OLS	OLS	OLS	SUR

*Note:* The dependent variable is the average rate of growth of per capita GDP 1960-2000. t-values are shown within parentheses.

The bottom line of Table 1 shows how the adjusted R<sup>2</sup> rises gradually as more explanatory variables are added to the growth regression and ultimately reaches 0.58, indicating that Model 7 explains well over a half of the cross-country variation in the long-run rate of

growth of per capita output.<sup>29</sup> Clearly, Model 7 does not tell the whole story of the determinants of growth; no model does that. For example, despite broad agreement among economists on theoretical grounds that foreign trade is good for growth, indicators of openness to trade often fail to register as significant sources of growth in econometric work. Too many explanatory variables in a single growth equation tend to get in each other's way. Presumably, this happens when two or more explanatory variables compete to explain the same source of efficiency gains.

When an interaction term involving the multiple of the natural capital share and the democracy variable is added to Model 7 in the spirit of Mehlum, Moene and Torvik (2006) and Collier and Hoeffler (2009), we find that the positive effect of democracy on growth is smaller (and in a few extreme cases turns negative) in countries with a high share of natural capital in national wealth (not shown). This result suggests that increased dependence on natural resources undermines the growth gains from democracy. Collier and Hoeffler (2009) find the same. They report that large resource rents tend to undermine checks and balances, thereby unleashing patronage politics and undercutting the benefits that otherwise would flow from democracy, including electoral competition, to growth. In their results, this mechanism outweighs the channel through which democracy effectively restrains rent seekers, thus making a larger contribution to growth in resource-rich countries than elsewhere. These findings suggest that resource-rich economies need particularly strong checks and balances to contain the potential damage from rent seeking. The above result entails that the negative effect of natural resource dependence on growth is significantly more negative in democracies than under authoritarian regimes (not shown). This result follows from the earlier one and suggests that the checks and balances that Collier and Hoeffler (2008) call for are not yet in place in many countries. From this point of view, our empirical findings on the interaction between natural resource dependence and democracy accord also with those of Mehlum, Moene and Torvik (2006) who report that good institutions deflate the damaging effects of resource dependence on growth.

The results in Model 7 can be questioned on the reasonable grounds that several of the explanatory variables are likely themselves to be endogenous. In particular, it is reasonable to think of democracy, investment, education, and fertility as endogenous economic

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<sup>29</sup> The drop in the adjusted  $R^2$  when democracy is added to the regression in Model 4 stems from the decrease in the number of observations.

variables that depend, among other things, on initial income, the sole clearly exogenous variable in the model. For simplicity, we will view the two natural capital variables as exogenous as well. Rather than look for virtually impossible-to-find instruments with the requisite properties to address the potential endogeneity problem at hand, we apply the SUR method. By this method, democracy, investment, education, and fertility are first separately regressed on initial output and the two natural capital variables. By design, the predicted values from those regressions are themselves exogenous. When those predicted values are used instead of the corresponding original values in the growth regression, all the explanatory variables in that regression are exogenous. The effects on natural resource dependence on growth via democracy, investment, education, and fertility are present in the growth equation. Even if the direct effect of natural resource dependence on growth were found to be insignificant, there would still be room for natural resource dependence to move growth through the four dependent variables of the auxiliary equations.

The results of estimating our growth model as part of this five-equation system are presented in Model 8 in Table 1. They are virtually the same as in Model 7. Provided we accept that the two natural capital variables are approximately exogenous for our purposes and that the system is correctly specified, the similarity between the results from Models 7 and 8 seems to suggest that endogeneity, at least that part of it that stems from democracy, investment, education, and fertility, does not severely contaminate the results in Model 7.<sup>30</sup>

The results from Model 7 accord reasonably well with a number of recent empirical growth studies. In Model 7, the coefficient on initial income suggests a conditional convergence speed of almost two per cent per year. This is not far below the two per cent to three per cent range typically reported in econometric growth research. The coefficient on the natural resource dependence variable suggests that an increase in the share of natural capital in total wealth by 20 percentage points reduces per capita growth by half a percentage point, even if natural resource abundance may at the same time be good for growth. This effect is broadly in line with several recent studies, beginning with Sachs and Warner (1995), that have reported an adverse effect of natural resource dependence on

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<sup>30</sup> The auxiliary equations for democracy, investment, education, and fertility (not presented) show a significantly positive effect of initial income on democracy and education, an insignificant effect on investment, and a significantly negative effect on fertility, all as expected. They also show a significantly negative effect of natural resource dependence on democracy, investment, and education and a significantly positive effect on fertility. At last, they show a significantly positive effect of natural capital abundance on democracy and investment, an insignificant effect on education, and a significantly negative effect on fertility.

growth, based on various measures of the natural resource intensity variable.<sup>31</sup> The coefficient on the natural resource abundance variable is discussed in the next subsection. The coefficient on the investment rate suggests that an increase in investment by 37 per cent (e.g., from 18 per cent of GDP to 25 per cent) increases annual per capita growth by half a percentage point, a strong but fairly typical result in those growth studies that report a statistically significant effect of investment on growth (rather than leaving investment out on the grounds that it is an endogenous variable like growth). The coefficient on the education variable in Model 7 means that an increase in secondary-school enrolment by 90 per cent (e.g., from 25 per cent to 48 per cent) increases per capita growth by half a percentage point. A reduction in fertility from 4.25 births per woman to three births per woman increases annual per capita growth by half a percentage point. This suggests a significant population drag on growth or, alternatively, an additional channel through which the build-up of human capital aids growth.

#### **4.2. Net effects of natural capital**

We have seen that natural capital influences economic growth in two ways. An increase in the share of natural capital in total wealth reduces economic growth while an increase in natural capital per person stimulates growth. Because natural capital per person equals, by definition, the multiple of the share of natural capital in total wealth and wealth per person, Model 7 in Table 1 suggests that the total effect of an increase in the natural capital share on economic growth is  $-0.025$  plus  $0.041$  times wealth per person (in hundreds of thousands of US dollars). Therefore, the total effect of an increase in the natural capital share on growth declines with wealth per person but remains negative as long as total per capita wealth is below USD 61,000 ( $= 0.025/0.041 \times 10^5$ ). For comparison, the median total per capita wealth in our sample is USD 35,000. In the sample, 106 countries have total wealth below USD 61,000 and 58 countries have more than that. This means that an increase in the natural capital share tends to reduce growth in developing countries, but may well increase growth in industrial countries. Hence, the net effect of an increase in the natural capital share on growth is negative in two-thirds of the countries in the sample. These results can be supplemented by tracing the additional effects of increased natural capital on real capital via blunted incentives to save and invest; on human capital through neglect of education; on

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<sup>31</sup> For a contrary view, see Lederman and Maloney (2008).

social capital via rent seeking, civil and political oppression, corruption, and so forth, as well as on financial capital through failure to develop institutions and on foreign capital through protectionism along the lines discussed in Section 2.

### 4.3. Relative importance of different sources of growth

What do the results reported here suggest about the relative importance of the different determinants of growth included in Model 7? To see this, consider a country whose growth performance is correctly described by Model 7 in Table 1 and where five of the determinants of growth listed – natural capital share, democracy, investment, education, and fertility – move in a growth-friendly direction by one standard deviation each, shown within parentheses after each variable, while initial income and natural capital per person remain unchanged.

**Table 2. Decomposition of per capita growth (in per cent)**

Per capita growth	2.42	1.00
Natural capital share (19.0)	0.47	0.19
Democracy (6.4)	0.35	0.14
Investment (log, 0.29)	0.39	0.16
Secondary-school enrolment (log, 0.86)	0.48	0.20
Fertility (1.8)	0.73	0.30

*Note:* The table shows the contributions to per capita growth per year of a decrease in the natural capital share and fertility and an increase in democracy, investment and school life expectancy by one standard deviation each variable. In the last column, the growth rate in the top row is normalized to one. Standard deviations are shown within parentheses.

Table 2 shows that such a change would increase the country's per capita growth by 2.42 percentage points and, moreover, disentangles the individual contributions of the five separate determinants of growth to this outcome. For comparison, the median per capita growth rate in our sample from 1960 to 2000 is 1.5 per cent per year. The last column

normalizes the preceding column by assuming instead that each variable changes by 41 per cent of a standard deviation such that per capita growth increases by one percentage point. Strikingly, the human capital variables – education and fertility – account for a half of the increase in growth by one percentage point, with investment in real capital, natural resource dependence, and democracy accounting for the remaining half. Accounting for roughly a fifth of the total effect, the natural capital share makes an economically as well as statistically significant contribution to economic growth for given natural capital per person. Investment and democracy also make a difference to growth, accounting for roughly a sixth of the total effect each. In this exercise, none of these variables can be counted out. They all make a difference.

## 5. Conclusion

The list of countries that have failed to use their abundant natural resources to foster rapid economic and social progress is a long one. Before we conclude, consider Nigeria which has not been mentioned thus far in this paper except in passing.

Nigeria's per capita GDP grew more than twice as fast in the first decade after independence, 1960-1970, as it did subsequently despite the colossal export revenue boom of the 1970s and beyond. Per capita growth in Nigeria has averaged 1.1 per cent per year since 1960. Life expectancy has increased by ten weeks a year on average for a total of ten more years of life for the average Nigerian from independence compared with 25 more years in Algeria, for example. This is not much to show for all of Nigeria's oil proceeds. Gross mismanagement of the oil rent appears to be at the root of Nigeria's problems, and Nigeria is not alone.

To get Nigeria growing again it has been suggested that oil revenues must be transferred from public hands to the private sector.<sup>32</sup> But the private sector is far from infallible either as events in world financial markets, including Nigeria, since 2007 have demonstrated once again. Consider this analogy: If judges prove corrupt, the solution is not to privatize the judicial system. Rather, the solution must be to replace the failed judges and reform the system by legal or constitutional means aimed at securing the integrity of the courts. If the privatization route is taken, however, it matters to whom in the private sector the oil rent is

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<sup>32</sup> Sala-i-Martin and Subramanian (2003).

transferred. If the rent is divided evenly among the adult population as in Alaska, the allocation can be deemed fair if not necessarily efficient. If, on the other hand, the resource rent is granted to select interested parties as in Iceland where fishing quotas are handed free of charge to boat owners, the allocation fails the fairness test as well as the efficiency test.

In this spirit, rather than dwell on failure, this paper has highlighted some key features of some of the most successful natural resource rich countries, especially Norway and also, briefly, Botswana, Chile, and Mauritius. Empowered by vivacious trade, strong emphasis on education, good policies, and good governance, these countries were able to harness their resource rents for the benefit of the people, the rightful owners of the resources by local laws as well as by the International Covenant on Civil and Political Rights. Privatization was not part of the solution. The United States remains the sole country that transferred its oil wealth to private companies, long ago, and quite legitimately within its democratic system of government. By contrast, the Norwegian government in its role as guardian of the people has kept a tight grip on the country's oil wealth while at the same time setting up a governance structure intended to safeguard the Oil Fund, now Pension Fund, from political interference. Clearly, African countries with pressing economic and social needs, cannot be expected to show the same patience as the Norwegians. Africa is in a hurry.

Even so, African countries have it within their grasp to build up governance structures designed to separate the management of their resource wealth from short-term political pressures. Any country with an independent judiciary or an independent central bank or both knows by experience how to set up institutions for the purpose of immunizing from the vicissitudes of the political process those public policy spheres that are deemed too important to be left in the hands of politicians. But even if this task can be satisfactorily accomplished, it remains desirable and necessary to tailor fiscal, monetary, and exchange rate policies and institutions in resource-rich countries to their special circumstances, not least to increase as far as possible the efficiency of revenue collection and to uproot the scourge of overvaluation.



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Figure 1. Share of Natural Capital in Total Tangible Capital

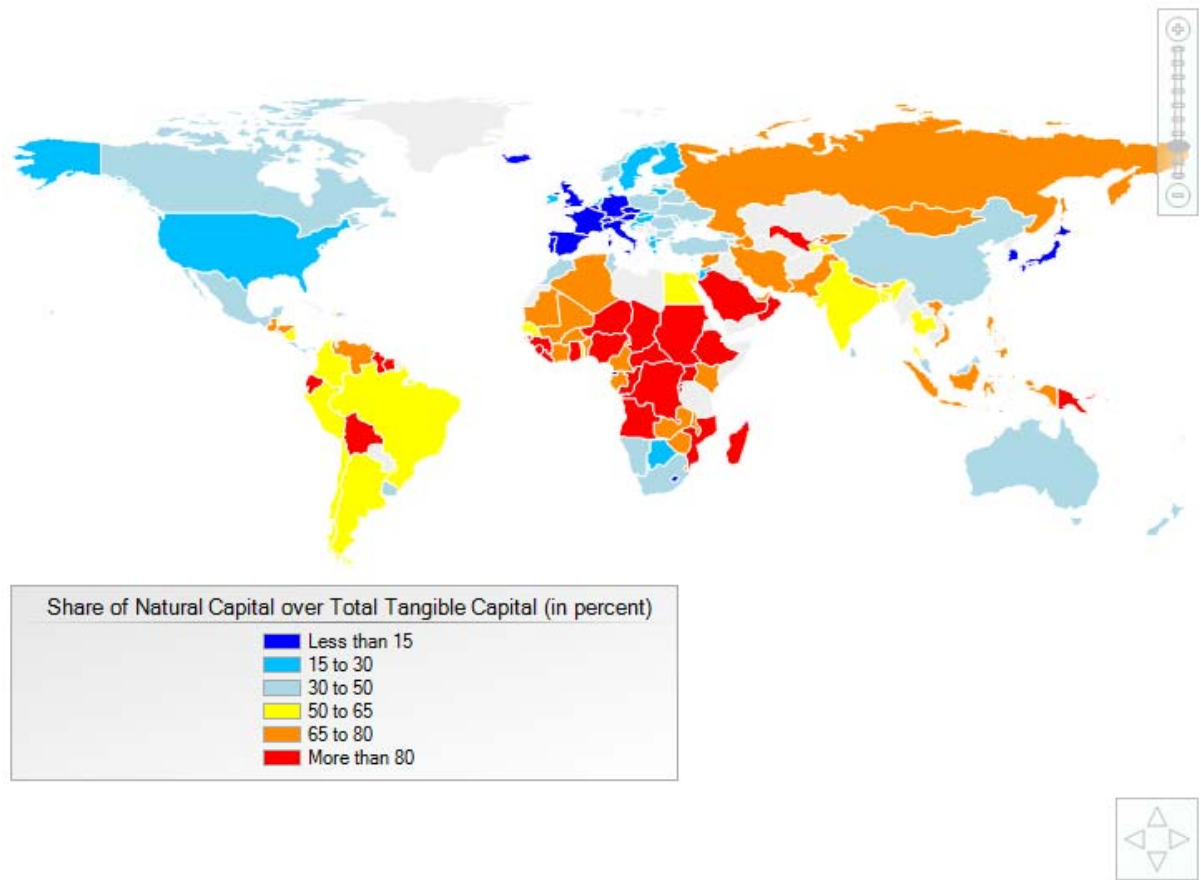


Figure 2. Share of Natural Capital in Total Capital

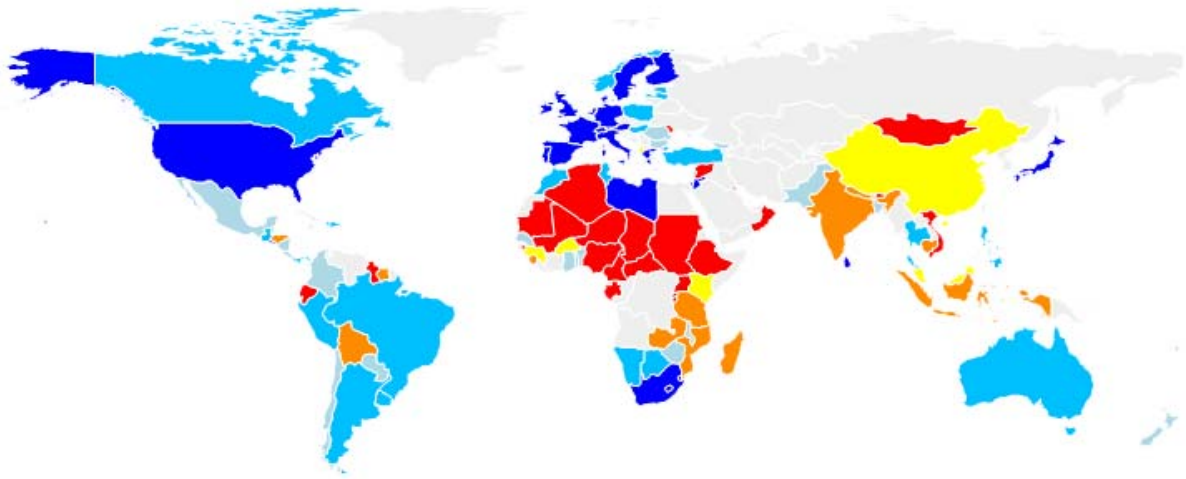


Figure 3. How Oil Exports Crowd Out Non-Oil Exports

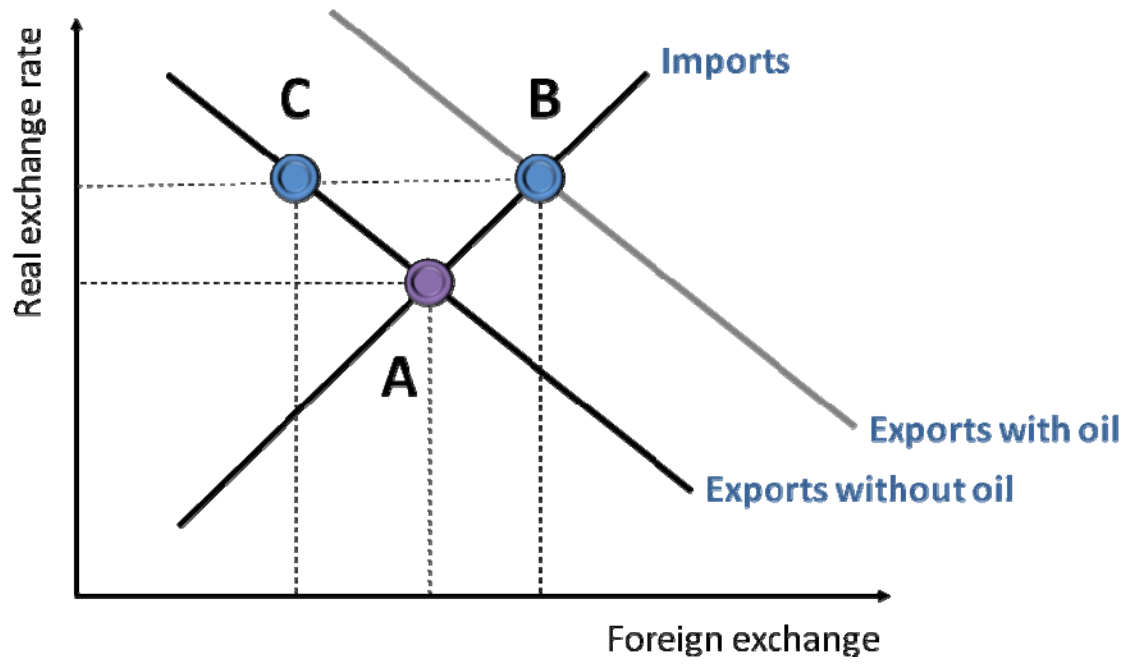


Figure 4. Norway and Oil

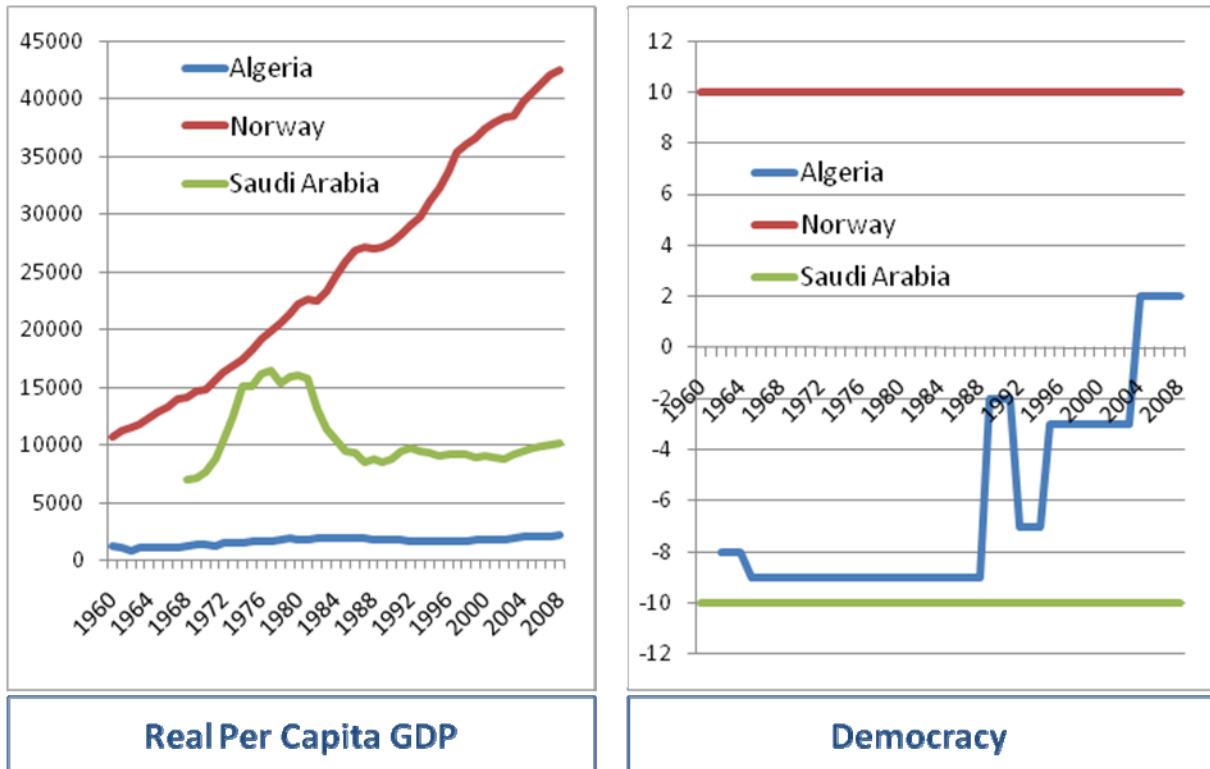


Figure 5. Botswana and Diamonds

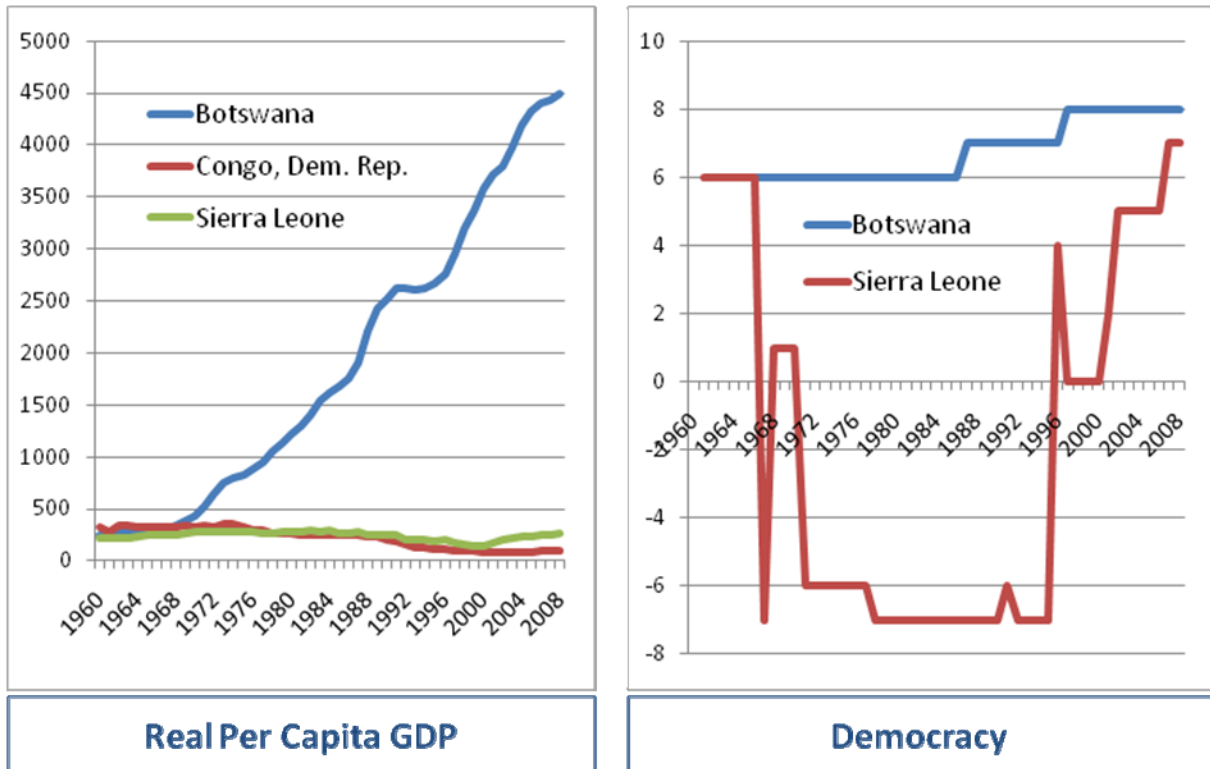


Figure 6. Mauritius and Sugar

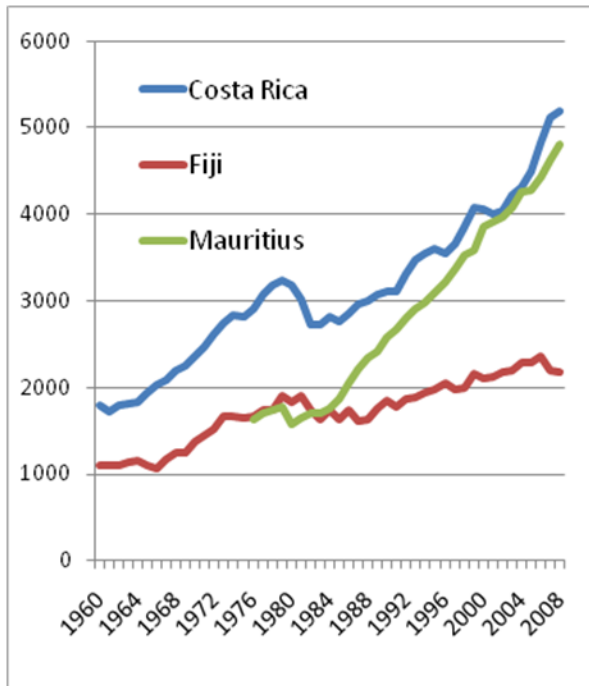
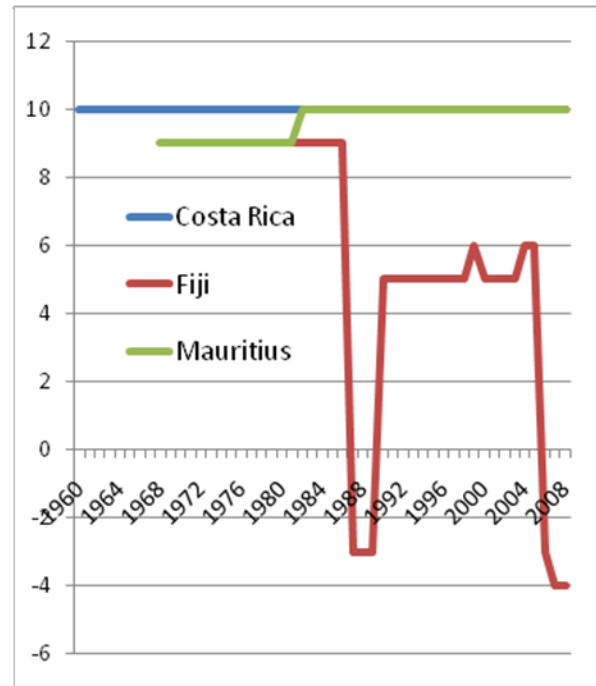
**Real Per Capita GDP****Democracy**



Figure 7. Chile and Copper

