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Corruption, the Resource Curse and Genuine Saving

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Abstract

Genuine saving is an established indicator of weak sustainable development that measures the net level of investment a country makes in produced, natural and human capital less depreciation. Maintaining this net level of investment above zero is a necessary condition for sustainable development. However, data demonstrate that resource-rich countries are systematically failing to make this investment. Alongside the familiar resource curse on economic growth, resource abundance has a negative effect on genuine saving. In fact, the two are closely related insofar as future consumption growth is restricted by insufficient genuine saving now. In this paper, we apply the most convincing conclusion from the literature on economic growth – that it is institutional failure that depresses growth – to data on genuine saving. We regress genuine saving on four indicators of institutional quality in interaction with an indicator of resource abundance. The indicators of institutional quality are corruption, bureaucratic quality, the rule of law and political constraints on the executive. We find that reducing corruption has a positive impact on genuine savings that is robust across different estimation procedures.

Key words: weak sustainability, corruption, institutional quality, resources, curse

JEL-classification: E21, E60, Q32, Q33, Q38, Q48

Abbreviations: Genuine Savings (GS); Net National Product (NNP); International Country Risk Guide (ICRG); Political Constraints (POLCON).

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1. Introduction

Genuine saving (hereafter GS) is an established measure of weak sustainable development. In economic terms, development is not sustainable if an economy's total stock of capital is not maintained, that is if the GS rate is (persistently) allowed to drop below zero. *Weak* sustainable development assumes that natural and produced forms of capital are infinitely substitutable (Neumayer 1999, 2003).[1] Since its development in the mid-1990s, the World Bank (2004) has calculated GS rates retrospectively for more than 150 countries between 1970 and the present day. Although it finds that global GS rates have consistently been above zero and therefore above what one might call the 'unsustainability threshold' of zero, over the whole of this period GS rates have been alarmingly low and consistently below zero in certain countries of the world. Significantly, these countries are also generally resource-rich.

This observation is strongly reminiscent of the so-called 'resource curse' hypothesis in the economic growth literature: the phenomenon that resource-rich economies generally grow more slowly than resource-poor economies although, in theory at least, they have the means to invest in productive forms of capital. The link between the negative effect of resource abundance on GS and the resource curse on economic growth is therefore the failure of resource-rich countries to invest enough of their resource rents in other forms of capital.

Unsurprisingly, the resource curse on economic growth has generated a substantial literature over the past half-century or more that has sought to explain it (Auty 2001; Isham et al. 2003; Gylfason 2001; Atkinson and Hamilton 2003; Sala-i-Martin and Subramanian 2003). Many explanations have been put forward and one can broadly distinguish between more directly economic explanations and *political*-economic explanations that highlight the role of policy and/or institutional failure in poor economic performance (Auty 2001). Ultimately, it is difficult to resist the conclusion that it is political-economic failures that have been the root cause of slow growth. We draw succour from this finding and examine whether low GS rates in resource-rich countries can similarly be explained by particular political and institutional failings. More specifically, we test whether improving institutional quality in selected, distinct ways leads resource-rich countries to invest their resource rents more sustainably in other forms of capital. Section 2 explains GS in more detail, and outlines the empirical finding that resource abundance is negatively related to GS. Section 3 discusses the resource curse in terms of the growth literature. Section 4 explains our empirical strategy, section 5 outlines our results and section 6 provides a discussion.

2. Genuine saving and resource abundance: the unsustainable consumption of resource rents

The origins of GS can be traced back to the work of Solow (1974) and Hartwick (1977), who were concerned with modelling a development path in which social welfare does not decline in an economy exploiting a non-renewable resource. Given a range of simplifying assumptions[2], the economic planner's problem is to maximise the present value of social welfare over all time. Her task is to achieve an optimal mix of consumption and investment. Solving the maximisation problem produces a measure of net national product or NNP, which is equal to society's consumption plus the sum of net changes in the capital stocks valued at their shadow prices. It is possible to 'green' the optimisation model by including natural capital and further expand the measure by including human capital. The term 'genuine' was thus coined by Hamilton (1994) to reflect the fact that GS includes all forms of capital that generate utility.

It is the sum of net changes in all the capital stocks valued at their shadow prices minus consumption (i.e. NNP minus consumption) that is GS. Circumnavigating the rather complex construction and derivation (see Hamilton and Clemens, 1999):

GS = net investment in produced capital – net depreciation of natural capital (1)
+ investment in human capital

Keeping GS above or equal to zero is a necessary (but not sufficient condition) for ensuring sustainability under the weak sustainability paradigm. If GS is persistently below zero, then the economy is certainly not weakly sustainable, since future utility must be below current utility at some time in the future (Hamilton and Clemens, 1999).

The World Bank calculates GS, which it now calls "adjusted net saving" as follows:

GS = investment in produced capital – net foreign borrowing + net official transfers –
depreciation of produced capital – net depreciation of natural capital
+ current education expenditures (2)

- Investment in produced capital, net foreign borrowing and net official transfers are obtained from the national accounts. Although depreciation of produced capital is not, estimates can be derived from data on produced capital formation. The World Bank uses estimates undertaken by the United Nations Statistics Division. Note that net investment in produced capital and foreign assets are aggregated across both the private and public sectors. Looking ahead, this means that we will not be able to use government consumption or investment to explain GS rates.

- Net depreciation of natural capital can be divided at a basic level into resource extraction on the one hand and environmental pollution on the other. The latter is conceptualised as the use of sink capacity in order for it to be equivalent to capital depreciation. The Bank estimates resource extraction for a range of fossil fuels (oil, natural gas, hard coal and brown coal), minerals (bauxite, copper, iron, lead, nickel, zinc, phosphate, tin, gold and silver), and one renewable resource (forests). Note that due to data limitations there are a great many resources omitted, particularly renewable resources such as water resources, fisheries and soils etc. Depreciation of natural capital due to resource depletion is computed as the product of price minus average costs of extraction multiplied by the volume of extraction:

$$(P-AC)*R \qquad (3)$$

where P is the resource price, AC is average cost and R is the volume of extraction (in the case of a renewable resource R represents harvest beyond natural regeneration). Average costs are used instead of the theoretically correct marginal costs due to a lack of data.[3] Environmental pollution is taken to be the estimated damage cost of carbon dioxide emissions, where each ton of carbon emitted is valued at US$20 per metric tonne of carbon (from Fankhauser, 1995). Note that we omit this change in the capital stock, following Ferreira and Vincent (2003). This is justified, because the damage cost of carbon dioxide emissions is not equivalent to the environmental capital stock that determines the impact of climate change on a country's economy. Instead, it is the global concentration of carbon dioxide in the atmosphere, a function of global emissions, which does so. Empirically, it makes practically no difference to our estimations if the cost of carbon dioxide emissions is included in the GS measure.

- Investment in human capital is calculated as net educational expenditures. This includes both capital expenditures as well as current expenditures that are counted as consumption rather than investment in the traditional national accounts. This is certainly rather crude, but it is difficult to see how investment in human capital could be estimated otherwise for so many countries over such a long time horizon. Dasgupta (2001, p.C9f.) argues that it is an overestimate since human capital is lost when people die. Against this one might object that part of the human capital stock might have been passed on so that it is not really lost once individuals die or, to be precise, leave the workforce. In any case, such a correction would be difficult to undertake.

World Bank GS estimates for the period 1970-2001 have shown significant differences from country to country. One important trend to emerge is that resource-rich countries are the poorest genuine savers (see also Atkinson and Hamilton, 2003). Figure 1 plots period-average GS rates against resource abundance for 145 countries. Resource abundance is measured as the average share of fuel and mineral product exports in total exports.

< Insert Figure 1 around here >

With the exception of Algeria and Guinea, for whom GS was just above zero for the period 1970-2001, every country with an average share of fuel and mineral exports in total exports of over 60% had negative GS. In contrast, most resource-poor countries, especially the cluster of countries with an average share of fuel and mineral exports in total exports of under 20%, had positive GS. In Sub-Saharan Africa, it must also be said that net produced capital investment is often negative too. In other words, the total 'man-made' wealth of these countries is also decreasing, and the World Bank's estimates of net natural capital depreciation simply worsen the situation. This is the case in Guinea-Bissau, for example. Nevertheless, one important conclusion we can draw from the World Bank's data is that the countries with the greatest natural resource extraction are also the poorest performers in terms of GS (Neumayer, 1999). Put another way, they are failing to invest a sufficient proportion of their resource rents in other forms of capital. This is striking, because it bears a considerable similarity to arguments made with respect to the effect of natural resource intensity on economic growth.

3. The 'resource curse' hypothesis and policy failure

"One of the surprising features of economic life is that resource-poor economies often vastly outperform resource-rich economies in economic growth" (Sachs and Warner, 1995, p2). Instances of this can be found throughout modern history. Although Auty (2001) correctly points out that there are exceptions to the rule[4], it is especially true of the post-1970 period. Between 1970 and 1993, per capita GDP in resource-rich countries grew around three times faster than it did in resource-poor countries (Auty, 2001). Perhaps this is because resource-abundance masks underlying trends in other determinants of economic growth such as trade policy and government efficiency. However, Sachs and Warner (1995) demonstrated that, even after controlling for these factors, resource-abundance is negatively related to growth. The phenomenon has become known as the 'resource curse'.

We might expect growth in agricultural economies to be slower than in manufacturing-led economies (Mellor, 1995), but the fact that fuel and mineral-rich economies perform especially poorly in relation to manufacturing economies (Auty, 2001) is a paradox. On the face of it, countries with abundant fuel and mineral resources ought to be able to sustain rapid growth both in the short and medium-term, as long as they invest the proceeds of their resource windfalls in other productive forms of capital. This is the formal link between the resource curse on economic growth and the negative effect of resource abundance on GS: productive capital investment is insufficient in resource-rich countries. Weitzman (1976) showed that, since NNP at time *t* is equivalent to consumption plus the value of changes in the capital stocks $\dot{w}$, then

$$\dot{w} = \bar{c} - c \tag{4}$$

where $\bar{c}$ is the stationary equivalent of future consumption: in other words, the hypothetical constant consumption level that would yield the same present value as the actual future consumption path (Ferreira and Vincent, 2003). Equation (4) thus implies that the greater is the level of investment in the capital stock at time *t* relative to consumption, the greater is the increase in consumption that can be achieved between *t* and all future times. Understandably, researchers have devoted increasing attention to explaining exactly why resource-rich countries fail to make the productive investments necessary to achieve stronger growth. We are especially interested in the outcome of this literature because of the strong connections it has with the negative effect of resource abundance on GS: it may help to cast some light on the causes of low GS in resource-rich countries.

A number of explanations of the resource curse have been put forward. One popular set of explanations, dating back at least to the 1940s, points the finger at the economic performance of the natural resources sector compared to the manufacturing sector. Primary resource prices have historically followed a path of secular decline (Prebisch, 1962). In addition, economies especially dependent on natural resource exports are vulnerable to short-term price fluctuations (Sala-i-Martin and Subramanian, 2003), and another theory suggests that demand for manufactures grows faster than demand for primary products. But we must ask why resource-rich countries have not succeeded in diversifying? As we have said, resource-rich countries ought to be able to invest their resource rents in other forms of capital, and lay the foundations for faster and enduring growth.

One reason why they might not is so-called 'Dutch disease'. Dutch disease can set in following the discovery of new resource stocks. The positive shock to the economy leads the real exchange rate (or real wages) to over-appreciate, which perversely causes the tradeable non-resource sector – in particular manufacturing – to contract in the face of less competitive conditions. Many economists believe that the manufacturing sector (and indeed the service sector) produces more positive externalities than the natural resources sector – based on learning-by-doing – and thus the contraction of the manufacturing sector in relative terms could lead to a fall in economic activity in absolute terms (Hirschman, 1958; Matsuyama, 1992). From an investment perspective, there may not be an incentive to invest in manufactures under these circumstances.

Resource-rich countries may also lack the incentive to make productive investments in human capital through educational expenditure (Birdsall *et al*., 2001; Gylfason, 2001). This may be connected to Dutch disease, insofar as currency appreciation may reduce the relative rate of return to educational investments. However, it seems more plausible to suggest that it is a failure of public policy that causes this underinvestment. Either governments with abundant natural resources are blind to the need to invest in human capital because they see themselves in a ‘comfort zone’, or they may even deliberately neglect to invest. Indeed, this leads us more generally to a political-economic explanation of the resource curse.

Resource-rich countries may underperform economically because the potential to ‘cash in’ on natural resource rents has an unsettling and inhibiting effect on the country’s political economy. The availability of resource rents leads to rapacious rent-seeking behaviour (Lane and Tornell, 1995; Torvik, 2002). One of the most appealing arguments is then that these rent-seeking opportunities give rise to corruption. There are multiple reasons why corruption may in turn slow economic growth by reducing investment (Mauro, 1995) and the productivity of investment, which might explain why some find resource abundance influences growth through the investment channel (Papyrakis and Gerlagh, 2003).

There are at least three reasons why corruption leads to underinvestment: (i) rent-seeking redirects resources from productive investment; (ii) corruption reduces the flow of new goods and technology through a *de facto* tax on *ex post* profits (Romer, 1994); and (iii) corruption generates uncertainty (Boycko *et al*., 1995). Corruption also tends to make what investment there is less productive, because the projects benefiting from corrupt practices are those most successful at rent seeking, rather than necessarily those offering the greatest return (Murphy *et al*., 1991). In this way, resources are reallocated from productive to rent-seeking activity. This will have a direct negative impact on economic performance. In addition, the efforts that must be made to avoid detection and punishment distort the economy. One aspect of this is that corrupt officials may tend towards financing projects for which the collection of bribes is easier. Once again, this is unlikely to be the most productive use of project finance. Leite and Weidmann (1999), in an important contribution, found that corruption had a negative effect on economic growth.

However, Isham *et al.* (2003) identify three other ways in which resource abundance stunts the development of a healthy political economy: (i) rentier effects; (ii) delayed modernisation; and (iii) an entrenched inequality effect. A rentier state finds it easy to extract significant revenues from concentrated sources. Clearly, states with abundant mineral and oil reserves are rentier states, since the resources are concentrated geographically and in terms of ownership. Given the revenues the government gains, it has a reduced incentive to tax the general population and with that to develop governance mechanisms. On the opposite side, citizens have less incentive to develop mechanisms of accountability and form the healthy 'civil society' that is believed to be a pre-requisite of democracy (e.g. Putnam, 1993). In addition, the government can rely on its resource revenues to repress dissent, either through buying off opposition (often with high-profile 'white elephant' infrastructure projects) or through violence. Moreover, since the state sector tends to dominate in rentier economies, an independent middle class fails to develop, and technocratic and entrepreneurial talent remains captive of state largesse in terms of employment and advancement opportunities (Chaudhry, 1997). As a result of this and other factors, democracy often fails to develop in rentier states (Karl, 1997; Ross, 2001).

The so-called delayed modernisation and entrenched inequality effects are quite similar. Political elites find it relatively easy to control resources and maintain their wealth in a point resource-led economy, but face the prospect of loosing their grip through industrialisation and urbanisation (Acemoglu *et* al., 2001; Moore, 1967). It follows that political elites in resource-rich countries resist modernisation pressures for as long as possible, especially investment in the manufacturing sector. It is at this point that we find a link back to the economic arguments made above, since resisting modernisation exposes the economy to the long-term decline in primary resource prices. Again, in this case civil society fails to develop. The main reason for this is that the concentration of capital ownership among political elites, together with production methods that favour the use of expert (foreign) labour and that are capital-intensive (Auty and Kiiski, 2001), reproduce social inequalities between those inside the elite and those outside it. This is the entrenched inequality explanation.

In fact, policy failure underpins any explanation of the resource curse, even the more strictly economic ones. For example, judicious management of natural resource endowments will prevent the generation of too much income too quickly that is the root cause of Dutch disease. In Norway, for example, the government takes around 80% of resource rents in taxes and fees and invests that amount in foreign assets (Gylfason, 2001). Indeed, Sala-i-Martin and Subramanian (2003) test directly whether it was exogenous macro-economic effects or endogenous policy failure that caused slow growth in resource-abundant countries. They find that natural resources appear to have a significantly negative and robust effect on growth, but that once institutions are controlled for they had either no effect or a small positive effect. Neither of the macro-economic variables – commodity price volatility and overvaluation of the exchange rate (Dutch disease) – was significant. Atkinson and Hamilton (2003) also provide tentative evidence that resource-rich countries were wasting their resource rents on government consumption, and that gross saving rates were lower in resource-rich countries with poor quality institutions (based on Sachs and Warner's (1997) aggregate index of various dimensions of institutional quality). This result also suggests that resource abundance is not a curse in itself. It is the political mismanagement of rents that is the root-cause of poor economic performance.

We conclude from the literature that the resource curse on economic growth is most likely explained by policy failure. In section 2 we demonstrated that resource abundance also seems to have a negative effect on GS. We will specify a model to explain genuine saving based on the interaction between natural resource endowments and institutional quality. The question remains, however, what element(s) of institutional quality seem to be important for economic performance *a priori*?

Corruption is intuitively appealing, not just because of its apparent impact on economic growth but rather because of its specific effect on investment. To the extent that corruption leads to underinvestment in physical and human capital and overconsumption of natural resources, the GS indicator should pick this up. However, work by Isham *et al*. (2003) suggests that we should test for other indicators of institutional quality as well. We test measures of bureaucratic quality, the rule of law and a measure of constraints on changing existing policy regimes. Following Isham *et al*. (2003), we decline to apportion these three indicators to particular theories. Instead, we test whether it is indeed true that these wider political economy effects depress genuine savings, or whether it is corruption in particular that matters.

4. Empirical strategy

We model variations in GS in a panel of data spanning up to 155 countries and 31 years. We specify a reduced-form model, with a particular focus on the interaction between resource abundance, which should have a negative effect on GS *ceteris paribus*, and indicators of institutional quality. However, it will also be important to capture determinants of gross saving, since GS is itself a ‘green’ extension of gross saving. Put another way, we want to ensure that the results we get are particular to *genuine* saving, so that we are able to draw specific conclusions about the unsustainable consumption of natural resource rents. Therefore our first task is to select determinants of gross saving as control variables, based on the literature.

Determinants of gross saving

Within the last fifteen years, a number of studies have analysed the empirical determinants of gross private or gross national saving[5] using panel data and reduced-form models. The studies that we draw upon are listed in table I, including data panel sizes and saving measures analysed.

< Insert Table I around here >

Across all studies, three thematic variables appear to have a robust and significant effect on gross saving: (i) income (per capita and growth), (ii) age dependency and (iii) urbanisation. Income per capita and income growth have a positive effect on gross (private) saving. Age dependency has a negative effect on gross saving, and in the empirical studies, urbanisation tends to have a negative effect on gross saving.

A number of other variables are tested in the above studies. We choose not to include them for three reasons. Firstly, some are generally insignificant in the empirical literature. These include macroeconomic indicators such as interest rates and terms-of-trade. Secondly, data are very limited. These include detailed indicators of financial liberalisation, social security systems and income inequality. Thirdly, some are components of GS, and therefore including them as independent variables effectively constructs a partial identity between the left-hand side and the right-hand side of the equation. These include fiscal policy variables such as government consumption and fiscal surplus.

Hypothesis and data

We test the hypothesis that, after controlling for the determinants of gross saving, *resource-rich countries have lower rates of genuine saving than resource-poor countries. However, this effect is likely due to policy failure and raising political/institutional standards in these countries will lead to greater investment of resource rents in other forms of capital, and to higher rates of genuine saving*.

We test this hypothesis with the following model:

$$GS_{i,t} = \alpha + \beta_1 \ln Y_{i,t} + \beta_2 Growth_{i,t-1} + \beta_3 Age_{i,t} + \beta_4 Urban_{i,t} + \beta_5 Inst_{i,t} + \beta_6 \ln Rs_{i,t} + \beta_7 Inst_{i,t} * \ln RS_{i,t} + T_t + \varepsilon_{i,t} \quad (5)$$

for country i at time t, where ε is an error term. The year dummies T allow for global changes in GS over time not otherwise accounted for in the explanatory variables.

GS is genuine saving. Data are available for the period 1970-2001 and are taken from the World Bank[6]; ln*Y* is gross national income per capita. We take the natural log to account for positive skewness. *Growth* is GDP growth, which is lagged one year to mitigate potential endogeneity bias; *Age* is age dependency; *Urban* is a measure of urbanisation: the percentage of the total population living in urban areas. Data for all these variables are taken from the World Bank's *World Development Indicators Online* database (World Bank, 2004).

Inst is institutional quality. We separately test four indicators of institutional quality. Indices of (i) corruption, (ii) bureaucratic quality and (iii) the rule of law are taken from the International Country Risk Guide (ICRG). These are scaled from 0, which indicates poor quality institutions (e.g. the highest corruption and the lowest bureaucratic quality) to 6, which indicates high quality institutions (e.g. the lowest corruption and the highest bureaucratic quality)[7]. The indices are compiled in an attempt to assess the investment risk faced by multinational companies and are based on expert judgements. Insofar as they ought to be positively related to investment, they are promising for our purposes. Unfortunately, the ICRG variables are only available for the period 1984 to 2001. In addition we test a measure of 'political constraints' (POLCON) that has been developed by Witold Henisz (2000). Henisz has designed POLCON as an indicator of the ability of political institutions to make credible commitments to an existing policy regime, which he argues is the most relevant political variable of interest to investors. Building on a simple spatial model of political interaction, POLCON makes use of the structure of government in a given country and the political views represented by the different levels of government (i.e. the executive, the legislature) to do so. It measures the extent to which political actors are constrained in their choice of future policies by the existence of other political actors whose consent needs to be achieved. Scores range from 0, which indicates that the executive has total political discretion and could change existing policy regimes at any point of time, to 1, which indicates that a change of existing policy regimes is totally infeasible. Of course in practice agreement is always feasible, so the maximum score is less than 1.

ln*Rs* is a measure of resource abundance, which we take to be the combined share of fossil fuel and mineral product in total exports (World Bank, 2004). This is similar to the measure used by Sachs and Warner (1995), with the exception of agricultural products, the inclusion of which has been widely criticised as Sachs and Warner (2001) admit. A more accurate and direct indicator of resource extraction might be resource rents, data for which are available from the GS database. However, since resource rents are an actual constituent of GS, including them would generate a partial identity. We take the natural log of *Rs* to account for positive skewness.

ln*Y*, *Growth*, *Age*, and *Urban* are the control variables. *Inst*, ln*Rs* and its interaction term are the main variables of interest. We expect ln*Rs* to have a negative effect on GS. However, if raising the standard of institutions in resource-rich countries reduces the unsustainable consumption of resource rents, then we would expect the interaction term *Inst**ln*Rs* to be positive. ln*Rs* is the predictor variable and *Inst* is the moderator variable, such that the negative relationship between resource abundance and GS becomes more positive – i.e. improves – the better are the political institutions. Where the interaction term is significant, one cannot interpret the coefficients on the individual components ln*Rs* and *Inst* in the conventional way. Instead, the coefficient on ln*Rs* in a model with a significant interaction term *Inst**ln*Rs* is the slope of ln*Rs* on GS when *Inst* is equal to zero.

Estimation strategy

We first estimate equation (5) with fixed effects, a design that allows for unobserved time-invariant variation in country-specific factors, with standard errors that are robust toward arbitrary heteroscedasticity and autocorrelation. We then estimate (5) using the Arellano-Bond one-step procedure (Arellano and Bond, 1991) with robust standard errors. This estimator has two advantages over and above the static fixed effects estimator. Firstly, it provides a dynamic framework in which present GS can be determined by past levels of GS and of the explanatory variables. This accounts for the inertia that is almost certainly present in the determination of saving rates (Loayza *et al*., 2000). Secondly, it allows us to mitigate for potential endogeneity problems: that some of the explanatory variables are likely to be jointly determined with GS. The Arellano-Bond estimator is a generalised-method-of-moments (GMM) estimator. It is constructed by first-differencing equation (5), producing:

$$GS_{i,t} - GS_{i,t-1} = \beta'(X_{i,t} - X_{it-1}) + (\varepsilon_{i,t} - \varepsilon_{i,t-1}) \tag{6}$$

where X is a vector of explanatory variables. First differencing removes the country-specific effect, but introduces, by construction, a correlation between the differenced lagged GS rate and the differenced error term. In addition, one must find a way to account for potential endogeneity in the explanatory variables. This is done by using internal instruments: i.e. instruments based on the lagged values of the explanatory variables. Note that in this case there is no need to lag GDP growth by one year.

Although the Arellano-Bond estimator has advantages over a static fixed effects estimator, it also suffers from problems. The use of instrumental variables leads to rather inefficient estimation with high standard errors. Moreover, whilst first-order serial correlation is expected, second-order serial correlation indicates that the original error term is serially correlated, which renders the estimations inconsistent. Fortunately, our tests for second-order autocorrelation suggest that this does not represent a problem in our data.

5. Results

Table II reports summary statistics and a bivariate correlation matrix. Although the corruption, bureaucratic quality and rule of law indices are all compiled by ICRG, the correlations between them are not especially high. In particular, the strength of correlation between corruption and bureaucratic quality and between corruption and the rule of law is only moderate (0.54 and 0.52 respectively). The correlations between POLCON and the ICRG indices are also moderate. There may indeed be a possibility of detecting different effects between the various measures of institutional quality and GS.

< Insert Table II around here >

Table III reports the results of four static fixed effects estimations of equation (5), each applying a different indicator of institutional quality. Of the control variables, GNI per capita and GDP growth are significant and positive determinants of GS in all models. Age dependency is significant and negative only in the POLCON model. However, this sample also has by some way the largest number of observations, so the statistical power of the POLCON model is in any case higher. Urbanisation is not significant in any of the four models. Resource exports, our measure of resource abundance, is significant at the 1% level and negative in all four models.

< Insert Table III around here >

In terms of our main hypothesis, the explanatory variable of interest is the interaction effect between the various indicators of institutional quality and resource exports. The interaction between lack of corruption and resource exports is positive and significant at the 10% level. The specific interpretation of this variable is that the negative relationship between resource exports and GS becomes more positive the less corruption there is. Reducing corruption by one index point increases the slope of resource exports on GS by 0.36 units. The coefficient on resource exports in table III shows the slope of resource exports on GS at a corruption index score of 0. Therefore, a one unit increase in resource exports leads to a decrease in GS of 4% in states with the most corruption. We can make use of the interaction term coefficient to estimate the slope of resource exports on GS at higher scores on the corruption index. At the mean index score of 3.6, a one unit increase in resource exports leads to a decrease in GS of only 2.7% (4-3.6*0.36), and at the maximum index score of 6 (i.e. in the least corrupt state), a one unit increase in resource exports leads to a decrease in GS of just 1.8% (4-6*0.36). Reducing corruption from the maximum to the minimum reduces the negative effect of resource abundance on GS by 55%. Clearly, on this basis, resource abundant countries can strike a more sustainable balance between the consumption and investment of their resource rents if they make efforts to reduce corruption.

The interactions between bureaucratic quality and resource exports and between the rule of law and resource exports are not significant. According to our results, improvements in these aspects of the political economy will in themselves not lead to higher GS. The interaction between POLCON and resource exports is significant at the 10% level and positive. For a one unit increase in political constraints, the slope of resource abundance on GS increases by 0.8 units. When there are no political constraints and POLCON is equal to zero, a one unit increase in resource exports leads to a 1.7% fall in GS. At the mean POLCON score of 0.44, a one unit increase in resource exports leads to a 1.3% fall in GS. At the maximum POLCON score of 0.89 (the highest level of political constraints), a one unit increase in resource exports leads to a 1.0% fall in GS. Increasing political constraints from the minimum to the maximum reduces the negative effect of resource abundance on GS by 59%. However, it is worth repeating that there are many more observations in the POLCON model, so statistical power is generally higher.

Table IV reports the results of our alternative estimations with the Arellano-Bond model. In this case, GS is also regressed on itself and is positive and significant in all cases. This demonstrates the inertia inherent in the determination of GS that we speculated upon earlier. Of the control variables, GNI per capita and urbanisation are insignificant. However, there is reason to expect GNI per capita to be endogenous. It follows that relaxing the assumption of strict exogeneity in the Arellano-Bond model could cause GNI per capita to become insignificant. GDP growth is significant and positive in all four models, while age dependency is significant and negative. Resource exports are not significant and negative across all four models, as was the case in the static fixed effects model.

< Insert Table IV around here >

The interaction effect between lack of corruption and resource exports is positive and significant at the 1% level. Indeed, for a one index point reduction in corruption, the slope of resource exports on GS increases by 0.7 units. When corruption is at its highest – at an index score of zero – a one unit increase in resource exports leads GS to fall by 1.7%. At the mean corruption index score of 3.6, a one unit increase in resource exports leads to an *increase* in GS of 0.8%, and at the maximum index score of 6 (i.e. in the least corrupt state), a one unit increase in resource exports leads to an increase in GS of 2.5%. Moving from maximum to minimum corruption reduces the negative effect of resource abundance on GS by 247%, reversing it. These data lend considerable support to the interpretation of the static fixed effects model, which tentatively showed that reducing corruption could help to put resource-rich countries on a more sustainable path. Neither bureaucratic quality, the rule of law nor POLCON are significant in interaction with resource rents. However, we note that the coefficient on POLCON is significant at the 1% level and negative. On the face of it, this is the opposite result to that which we would expect but, according to the rules for interpreting coefficients in interaction models, this simply shows the slope of POLCON on GS when log resource exports are equal to zero. When log resource exports are equal to zero, resource exports in levels are equal to just over zero. Furthermore, we have chosen to interpret the interaction effect in such a way that it is POLCON that may moderate the relationship between resource rents and GS. This interpretation is supported in the literature. In order to interpret the POLCON variable, we would have to hypothesise that resource rents moderate the relationship between POLCON and GS. The direction of causation is thus reversed, and there is no theoretical reason to expect resource rents to drive the relationship between POLCON and GS.

There may nevertheless be a theoretical reason why POLCON has an ambiguous relationship with GS. The index is constructed on the premise that increasing constraints on the ability of political actors to make unilateral decisions is good for investment, because in a constrained system actors can make credible commitments to an existing policy regime. However, as Henisz (2000) himself concedes, one can quite easily find examples of states with few political constraints but solid economic performance. Taking China as an example, it has a mean POLCON score of zero, indicating no constraints on political decision-making, yet it returns a mean GS rate of 15% for the period 1970-2001, above the mean.

6. Discussion

In tables 2 to 4 we have presented evidence on the relationship between institutional quality, resource abundance and GS. We asked the question, does improving the quality of various aspects of a country's political and bureaucratic institutions (both subjectively and objectively determined) result in a more sustainable mix of consumption and investment of resource rents? The World Bank's own estimates show that it is the most resource-abundant regions of the world that have been the poorest genuine savers over the last thirty years. Given that GS subtracts resource rents from net fixed capital formation and educational expenditures (as well as subtracting carbon dioxide emissions), this amounts to an unsustainable consumption of resource rents. More should have been invested in other forms of capital, if these regions were to pursue a more sustainable path.

There are strong connections between these findings and the so-called 'resource curse' hypothesis in relation to economic growth. That is, resource-rich economies have historically grown more slowly than resource-poor economies, particularly in the last thirty years or so. This is apparently paradoxical, since resource extraction should generate the income to make productive investments in other forms of capital. Resource-rich countries fail to do this. Although some direct economic explanations of the resource curse have been put forward in the past with a modicum of success – most notably 'Dutch disease' effects – it is ultimately policy failure that underpins the curse. This has inspired us to test whether improving institutional quality has a positive effect on the relationship between resource abundance and GS.

However, institutional quality is a broad concept and it has been necessary to refine what we mean and what we test. There are persuasive theoretical and empirical arguments in the literature that suggest corruption may be a major explanatory factor of the resource curse. They often describe a process in which investment is either misdirected or discouraged altogether. A failure to invest resource rents would depress GS, *ceteris paribus*. In addition, there are arguments for wider political economy effects, summarised in Isham *et al.* (2003). These explain the resource curse in terms of the control exerted by political elites over resource rents. There is little incentive to develop a competent government bureaucracy and to diversify the national economy into other sectors, a process that the political elites resist through a combination of undemocratic decision-making and repression of more-or-less violent forms.

Therefore we have tested four competing indicators of institutional quality in the framework of our hypothesis. We have tested corruption, using the ICRG index. In addition, we have tested bureaucratic quality and rule of law indices, also from ICRG, and POLCON (Henisz, 2000), an indicator of political constraints on decision-making. On the basis of our evidence, we suggest that corruption is a significant cause of low GS in resource rich countries, because it depresses investment. In both static fixed effects and dynamic estimations, the hitherto negative relationship between resource exports and GS improves as corruption is reduced. Although there is evidence in the static fixed effects model that political constraints may do the same, we do not find that these results are robust toward extending the estimation to a dynamic framework, and the magnitude of the effects are lower than for corruption. This is not to say that countries should only focus on anti-corruption measures: there are many other very persuasive reasons why all aspects of institutional quality should be improved. Indeed, improvements on one dimension are almost certain to lead to improvements in others. Nevertheless, in order to put themselves on a more sustainable investment pathway, we recommend that resource-rich countries strive to reduce the corrupt practices that stymie investment and make it unproductive.

NOTES

[1] As opposed to *strong* sustainable development, which assumes natural capital is either partly or wholly non-substitutable.

[2] See Dietz and Neumayer (forthcoming).

[3] In addition, there is some controversy over this method, which approximates the total Hotelling rent. See Neumayer (2000).

[4] For example, the growth of resource-abundant new European colonies in the late nineteenth century.

[5] Where gross national saving = gross private saving + gross public saving.

[6] Hhttp://lnweb18.worldbank.org/ESSD/envext.nsf/44ByDocName/GreenAccountingAdjustedNetSavingsH

[7] Until 1996, bureaucratic quality was scored 0-4. We rescale this data to lie between 0 and 6. However, none of the observations in our sample actually have a score of zero.

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Figure 1. Resource abundance and genuine saving between 1970 and 2001 (data from World Bank 2004).

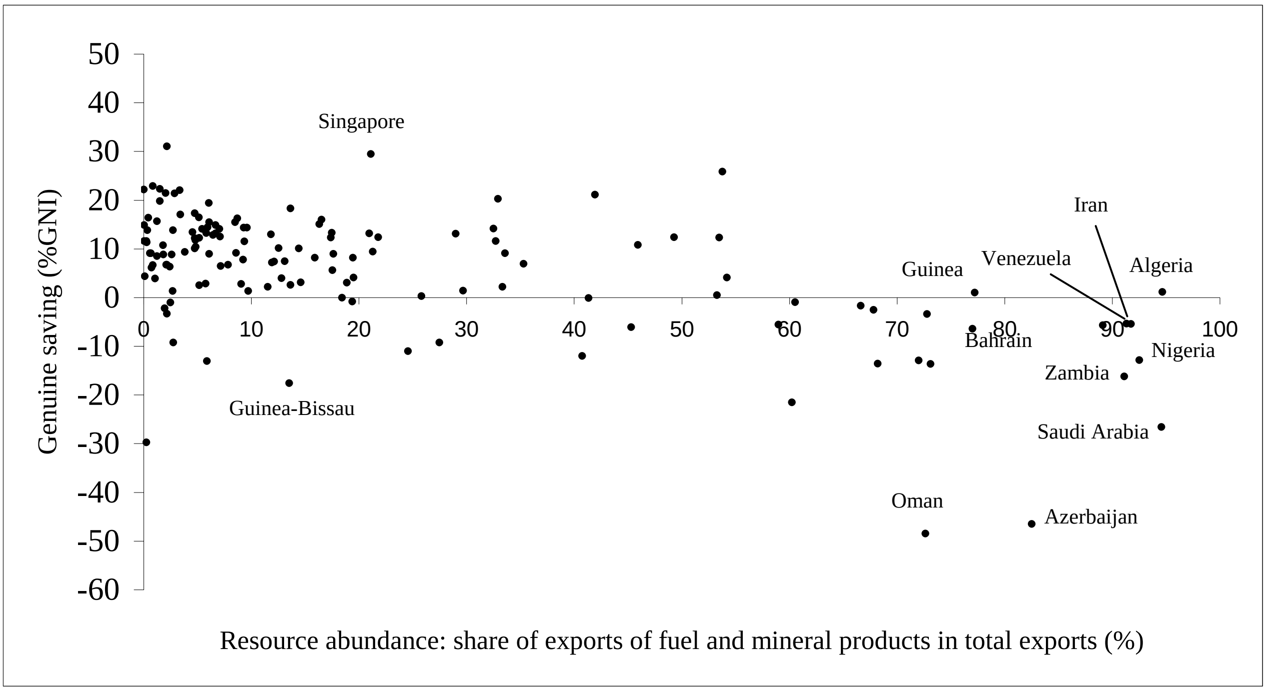

Table I. Empirical studies of the determinants of gross saving.

Study	Data panel	Saving type
Edwards (1996)	36 countries (11 industrialised; 25 developing) over 22 years	Private saving
Dayal-Ghulati and Thimann (1997)	5 Asian (ASEAN) and 9 Latin American countries over 20 years	Private saving
Loayza, Schmidt-Hebbel and Servén (2000)	World Bank's new Saving Project World Database (up to 35 years and 134 countries)	National, public, private and household saving
Corbo and Schmidt-Hebbel (1991)	13 developing countries over just 7 years	Private saving
Masson, Bayoumi and Samiei (1998)	21 industrial countries and 40 developing countries over 22 and 11 years respectively	Private saving
Haque, Pesaran and Sharma (1999)	21 industrial countries and 40 developing countries over 22 and 11 years respectively	Private saving
Samwick (2000)	World Bank's new Saving Project World Database (up to 35 years and 134 countries)	National, public, private and household saving

Table II. Summary statistics and correlation matrix (N = 1938).

	Mean	Std. Dev.	Min.	Max.
Genuine Saving/GNI	8.05	11.19	-54.89	44.32
GNI per capita (ln)	7.82	1.45	4.70	10.69
GDP growth (lagged one year)	3.54	4.57	-26.48	33.99
Age dependency	0.68	0.18	0.37	1.14
Urbanisation	58.31	22.86	4.56	100
Resource exports (ln)	2.21	1.55	-5.93	4.59
Lack of corruption	3.60	1.37	0	6
Bureaucratic quality	3.97	1.42	1	6
Rule of law	4.05	1.54	0	6
POLCON	0.44	0.34	0	0.89

	GS/GNI	GNI per capita	GDP growth	Age dependency	Urbanisation	Resource exports	Lack of Corruption	Bureaucratic quality	Rule of law	POLCON
Genuine Saving/GNI	1.00									
GNI per capita (ln)	0.21	1.00								
GDP growth	0.16	-0.08	1.00							
Age dependency	-0.34	-0.75	0.04	1.00						
Urbanisation	-0.08	0.80	-0.09	-0.63	1.00					
Resource exports (ln)	-0.38	0.03	-0.01	0.10	0.16	1.00				
Lack of corruption	0.03	0.53	-0.07	-0.31	0.28	-0.13	1.00			
Bureaucratic quality	0.30	0.77	-0.01	-0.64	0.51	-0.04	0.54	1.00		
Rule of law	0.16	0.71	0.01	-0.62	0.48	-0.02	0.52	0.72	1.00	
POLCON	0.26	0.65	-0.08	-0.63	0.49	-0.15	0.37	0.60	0.58	1.00

Table III. Static fixed effects estimates (robust standard errors in parenthesis).

	'Lack of corruption'	'Bureaucratic quality'	'Rule of law'	'POLCON'
GNI per capita (ln)	3.764***	3.185***	3.486***	4.853***
	(1.058)	(1.083)	(1.035)	(0.615)
GDP growth (lagged)	0.129**	0.129**	0.128**	0.140***
	(0.061)	(0.059)	(0.059)	(0.042)
Age dependency	-6.551	-7.217	-8.010	-17.015***
	(5.693)	(5.438)	(5.490)	(3.512)
Urbanisation	-0.053	-0.044	-0.052	0.055
	(0.090)	(0.087)	(0.087)	(0.053)
Resource exports (ln)	-4.054***	-2.648***	-3.448***	-1.669***
	(0.804)	(0.675)	(0.658)	(0.305)
Lack of corruption	-0.391			
	(0.418)			
Bureaucratic quality		0.318		
		(0.448)		
Rule of law			-0.495	
			(0.375)	
POLCON				-1.859
				(1.148)
Resource exports (ln)	0.357*			
*Lack of corruption	(0.194)			
Resource exports (ln)		-0.040		
*Bureaucratic quality		(0.164)		
Resource exports (ln)			0.215	
*Rule of law			(0.162)	
Resource exports (ln)				0.784*
*POLCON				(0.451)
R^2 within	0.19	0.23	0.22	0.14
N observations	1036	1158	1158	1938
N countries	99	107	107	118

Note: Dependent variable is GS rate (GS/GNI). Year dummies included, but coefficients not shown. * Significant at 10%, ** at 5%, *** at 1%

Table IV. Dynamic Arellano-Bond estimates (standard errors in parenthesis).

	'Lack of corruption'	'Bureaucratic quality'	'Rule of law'	'POLCON'
$(GS/GNI)_{t-1}$	0.402***	0.396***	0.390***	0.438***
	(0.092)	(0.080)	(0.083)	(0.058)
GNI per capita (ln)	0.688	-0.424	-0.455	0.172
	(1.806)	(2.211)	(2.038)	(1.532)
GDP growth	0.194**	0.192***	0.196***	0.181***
	(0.079)	(0.073)	(0.071)	(0.051)
Age dependency	-37.665**	-32.866**	-33.082**	-19.779**
	(16.911)	(14.674)	(14.076)	(9.790)
Urbanisation	-0.127	-0.117	-0.159	0.097
	(0.174)	(0.167)	(0.157)	(0.136)
Resource exports (ln)	-1.720**	0.055	-0.838	-0.127
	(0.6858)	(0.979)	(1.292)	(0.417)
Lack of corruption	-0.718			
	(0.539)			
Bureaucratic quality		-0.174		
		(0.811)		
Rule of law			-0.625	
			(0.762)	
POLCON				-4.615**
				(2.010)
Resource exports (ln)	0.655***			
*Lack of corruption	(0.222)			
Resource exports (ln)		0.085		
*Bureaucratic quality		(0.282)		
Resource exports (ln)			0.331	
*Rule of law			(0.320)	
Resource exports (ln)				0.943
*POLCON				(0.763)
Wald Chi^2	315.18	277.76	285.27	1023.18
2^{nd} order serial	-1.88	-1.52	-1.45	-0.23
autocorrelation	(0.060)	(0.129)	(0.147)	(0.818)
N observations	844	955	955	1629
N countries	90	98	98	109

Note: Dependent variable is GS rate (GS/GNI). Year dummies included, but coefficients not shown. * Significant at 10%, ** at 5%, *** at 1%