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Does the 'Resource Curse' hold for Growth in Genuine Income as well?

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Summary. — Existing studies analyzing the so-called 'resource curse hypothesis' regress growth in gross domestic product (GDP) on some measure of resource-intensity. This is problematic as GDP counts natural and other capital depreciation as income. Deducting depreciation from GDP to arrive at genuine income, we test whether the 'curse' still holds true. We find supporting evidence, but the growth disadvantage of resource-intensive economies is weaker in terms of genuine income than GDP. We suggest that this provides additional evidence in support of those who argue that the 'curse' is partly due to unsustainable over-consumption.

Key words — resource curse hypothesis; natural capital; depreciation, genuine income

1. INTRODUCTION

Being richly endowed with natural resources can make you relatively poorer as natural resource-intensive economies grow slower over time than economies that are less natural resource-intensive. Sachs and Warner (1995a) were not the first one to note this paradoxical result,[1] but their paper spurred an extensive and still growing literature aimed at explaining what drives this result (e.g., Mikesell, 1997; Auty and Mikesell, 1998; Ross, 1999; Auty, 2001; Isham et al., 2003; Sala-i-Martin and Subramanian, 2003).[2] These studies offer a diverse set of explanations covering, amongst others, terms of trade effect, dutch disease, institutional quality and political economy arguments. Others questioned the robustness of the result with respect to changes in the definition of natural resource-intensity (e.g., Stijns 2001) or observed that in terms of income levels (rather than growth) natural resource-intensive economies on average fare better rather than worse (e.g., Davis, 1995; Mikesell, 1997).

In this note, we do not seek to explain the so-called ‘resource curse’ directly. Instead, this paper’s original contribution is in examining whether the curse holds true for measures of genuine or true income as well. This is important because GDP is a particularly erroneous measure of income for resource-intensive economies. However, our results will provide supporting evidence to two recent studies (Rodríguez and Sachs, 1999; Atkinson and Hamilton, 2003) that have tried to explain the curse with unsustainable over-consumption in resource-intensive countries.

Existing studies look at growth in real gross domestic product (GDP). Of course, it is well known that GDP contains an element of depreciation of produced capital that should not be counted as income. It would therefore be more correct to analyze growth in real net domestic product (NDP) where depreciation of produced capital has been subtracted from GDP. This is typically not done for two reasons. First, the depreciation term is estimated based on simplifying (and contestable) assumptions and, more importantly, for most countries it makes very little difference whether one looks at GDP or NDP. This holds true whether or not economies are intensive in natural resources.

Things are different, however, when one starts taking into account depreciation of natural capital as well. Not only can depreciation terms be of significant size, but also depreciation tends to be higher for economies that are intensive in natural resources than for others that are not. With the accounting method for natural capital depreciation described below the correction to GDP can be as high as 30 per cent. There can therefore be a substantial gap between gross income and what one might want to call genuine income, that is GDP minus the depreciation of produced and natural capital, and the size of the gap is partly determined by the resource-intensity of economies. There is therefore a problem with the existing studies examining the 'resource curse' as they analyze growth in GDP, the wrong term, instead of growth in true or genuine income.

This article therefore tests whether the 'resource curse' holds true for growth in genuine income as well and, if so, whether the negative effect of natural resource-intensity on growth is over- or under-estimated by erroneously examining growth in GDP. To our knowledge, no other study has ever done this. Winter-Nelson (1995) computes what he calls environmentally adjusted income for 18 African resource exporters, but he merely demonstrates that a strategy of export expansion has led to growth in GDP, but not growth in environmentally adjusted income. He therefore does not test for the 'resource curse' itself. Also, his sample size is of course very small. Mikesell (1997, p. 195) suggests that if GDP was adjusted for natural capital depreciation, then the 'resource curse' would be even stronger over the period 1980 to 1993. However, he does not validate his suggestion with any general empirical test, instead referring to Repetto et al.'s (1989) single country study of Indonesia, in which adjusted income grew slower over the period 1971 to 1984 than GDP. Indeed, we will show that the exact opposite to Mikesell's suggestion is actually the case as the 'resource curse' is weaker in terms of growth of genuine income than growth of GDP. Atkinson and Hamilton (2003) examine whether negative genuine savings rates (gross investment minus depreciation of produced and natural capital divided by GDP) can explain the 'resource curse', but they do not examine whether the curse holds for growth in genuine income.

2. EXPLAINING THE 'RESOURCE CURSE'

How can the blessing of an extra endowment with natural resources turn into a curse? A priori this represents a puzzle, even a paradox. Following Auty (2001) one can distinguish exogenous from internal explanations for the poor growth performance of natural resource-intensive economies. Revenue volatility and a long-term declining trend in the terms of trade of resource exporters represent explanation attempts that can be derived from structuralist economic theory à la Prebisch (1950). The Dutch disease phenomenon is another and one of the most frequently cited exogenous explanations. It refers to the decline in the productivity and competitiveness of the manufacturing and other tradeables sector following the real exchange rate appreciation in the wake of a resource boom (Gelb and associates, 1988; Sachs and Warner, 2001). This negative effect becomes exacerbated if the manufacturing and other tradeables sector is characterized by economies of scale. The exogenous explanations leave little space for policy makers to avoid the problem. In comparison, the internal explanations of the 'resource curse' all lay the blame squarely at bad policies. A link between the two is given by the fact that the manufacturing and other tradeables sector becomes damaged not only by dutch disease, but also by misguided industrial policies in the form of protectionist barriers for import-substitution, which has been typical for many natural resource-intensive economies. More importantly, resource abundance might lead to a rentier economy with a predatory state: corruption, political conflict and inequalities are rampant, economic institutions are poorly developed, human capital accumulation, entrepeneurship and innovative activity are crowded out and policy makers are more interested in resource transfers than developing and modernizing the country's economy (Lal and Myint, 1996; Gylfason, 2001; Auty, 2001; Isham et al., 2003).

Two studies have emphasized the problem that natural resource abundance allows countries to engage in excessive consumption that is not sustainable into the future. We will concentrate on these two studies as our empirical analysis provides some evidence in their favor. Rodríguez and Sachs (1999) employ a Ramsey growth model and a calibrated dynamic general equilibrium model of the Venezuelan economy to argue that economies rich in natural resources are likely to live beyond their means. Indicative of this is that resource-intensive economies, whilst growing slower than less resource-intensive ones, also tend to have higher absolute income levels – a point demonstrated by Rodríguez and Sachs (1999), but already pointed out by others (e.g., Davis, 1995; Mikesell, 1997). In the transition to the steady state, the resource endowment allows the country to afford extraordinary consumption possibilities derived from unsustainably high income levels. In other words, 'a resource rich economy will adjust to its steady state from above, not from below' (Rodríguez and Sachs, 2003, p. 4). During the transition it might display negative growth rates in GDP on average. With exogenous productivity growth it might escape negative growth rates, but in any case growth rates will be lower than if the country did not live on unsustainable income levels beyond its means. Theoretically, the problem could be circumvented if the resource-intensive economy invests its resource rents in international assets paying permanent annuities. However, if there are restrictions on investment abroad or a preference for investing domestically, then these economies will experience consumption booms that are unsustainable beyond the short-term.

Atkinson and Hamilton (2003) provide a similar argument together with corroborating evidence from cross-sectional growth in GDP regressions. They argue that resource-intensive countries are likely to have excessive consumption fuelled by the windfalls of natural resource extraction. Their regressions show that the interaction of large resource rents with government consumption is associated with lower growth. Atkinson and Hamilton (2003) also find that natural resource-intensity in economies with negative genuine savings rates is associated with a growth rate that is statistically significantly below zero. Natural resource-intensity in economies with a positive genuine savings rate is also estimated to have a negative coefficient, but it is not statistically significant. Furthermore, whilst Sachs and Warner (1997) did not find evidence that resource-intensity is associated with lower gross savings and investment rates, Atkinson and Hamilton (2003) on the whole find a negative correlation between natural resource-intensity and genuine savings rates.

We will see below that our results provide independent evidence in favor of these two recent explanations of the ‘resource curse’. Before coming to these, we have to discuss how one should account for natural capital depreciation and the implications of such accounting for the ‘resource curse’.

3. ACCOUNTING FOR NATURAL CAPITAL DEPRECIATION

Resource economists have studied the importance of as well as methods for accounting for natural capital depreciation at least since Hartwick’s (1977) influential paper. There he showed that under certain circumstances economies, which extract a non-renewable resource, can only maintain their consumption levels over time if they invest the full resource rents into produced capital. Throughout the 1980s and the 1990s accounting for natural capital depreciation has figured prominently in natural resource economics as part of the sustainable development research agenda (El Serafy, 1981, 1989; Repetto et al., 1989; Serôa da Motta and Young, 1995).

That the GDP of natural resource-intensive economies does not reflect their genuine income levels has not escaped the early attention of affected countries either. For example, Shihata (1982, p. 202), then Director-General of the Organisation of Petroleum Exporting Countries (OPEC) Development Fund, notes that the income of the Arab oil-exporting economies ‘is in reality a cash exchange for a depletable natural resource’. OPEC itself commissioned a study in 1984, which opens with a sentence of admirable clarity: ‘The GDP of oil-exporting states is exaggerated because some of their “income” is due to the consumption of depletable oil resources and hence is liquidation of capital, not income’ (Stauffer and Lennox, 1984, p. 6).

Unfortunately, how best to account for natural capital depreciation is heavily debated and no consensus has emerged in the relevant literature (Hartwick and Hageman, 1993; El Serafy, 1981, 1989; Vincent, 1997; Santopietro, 1998). It does have a very simple answer, however, as long as one assumes that economies are competitive and inter-temporally efficient (Hartwick and Hageman, 1993; Hamilton, 1996; Neumayer, 2003). In this framework natural capital depreciation is equal to total Hotelling (1931) rent:

$$(1) \qquad (P - MC) \cdot R$$

where P is the resource price, MC is marginal cost and R is resource extraction. In the case of a renewable resource, R would be resource harvesting beyond natural regeneration. One of the major difficulties of applying this theoretically correct method in reality is that data on marginal cost are frequently unavailable. Average cost data are more available. Most studies applying this method have therefore replaced marginal cost with the more readily available average costs and calculated depreciation according to the following formula:

(2) $$(P - AC) \cdot R$$

A popular alternative has been what is known as the El Serafy (1981, 1989) method:

(3) $$(P - AC) \cdot R \cdot \left[\frac{1}{(1+r)^{n+1}} \right]$$

where r is the discount rate and n is the number of remaining years of the resource stock. For simplicity, this is often set equal to the static reserves to production ratio, which is the number of years the reserve stock would last if production was the same in the future as in the base year. If $r > 0$ and $n > 0$, then (3) will produce a smaller depreciation term for resource extraction than (2). If either n or r are large, the depreciation will be rather small.

Equation (3) is also called the 'user cost' of resource extraction since it indicates the share of resource receipts that should be considered as capital depreciation. The formula for the El Serafy method is derived from the following reasoning: receipts from non-renewable resource extraction should not fully count as what El Serafy calls 'sustainable income' because resource extraction leads to a lowering of the resource stock and thus brings with it an element of depreciation of the resource capital stock.[3] Whilst the receipts from the resource stock will end at some finite time, 'sustainable income' by definition must last forever. Hence, 'sustainable income' is defined as that part of resource receipts which if received infinitely would have a present value just equal to the present value of the finite stream of resource receipts over the life-time of the resource. Natural capital depreciation is then the difference between resource rents and 'sustainable income'. Appendix 1 shows why this reasoning leads to equation (3).

Hartwick and Hageman (1993) show that the El Serafy method can be understood as an approximation to equation (1), which to repeat represents the theoretically correct depreciation in a framework of a competitive inter-temporally efficient economy. Its main advantage over the World Bank method in equation (2) is that the El Serafy method can use average cost without apology as it does not depend on marginal cost. The World Bank method, on the other hand, needs to replace marginal cost with average cost as marginal cost is not readily available. Due to the replacement of marginal with average cost it can also merely represent an approximation to the theoretically correct method. Which of the two methods creates the greater bias is not clear in general. Under certain assumptions about the resource extraction cost function, the two methods can be shown to be two polar cases of the true depreciation value and the bias depends on the elasticity of the marginal cost curve with respect to the quantity extracted (Vincent, 1997; Serôa da Motta and Ferraz do Amaral, 2000).

In this study, we will use the method given by (2). The main reason is that reliable reserve data of natural resources are difficult to get hold of. Additionally, as long as known reserves last for little more than 20 years or so, which typically holds true for many resource-intensive economies, and the discount rate is not too high, then the