IS THE NATURAL RESOURCE "CURSE" A MYTH?

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Abstract

Until quite recently, most economists believed countries benefit from possessing abundant natural resources. Thus it came as a shock when in 1997 and 2001 Sachs and Warner published 2 papers claiming that countries with abundant natural resources grow more slowly than countries with few resources. Far from being a blessing, natural resources, they concluded, are a "curse". Sachs and Warner provided several reasons for their finding. Countries with abundant natural resources tend to suffer from "Dutch disease". Overvalued exchange rates hinder the emergence of alternative tradable goods and services. Highly concentrated sources of rent mean countries with abundant natural resources tend to be corrupt. Highly paid jobs in extractive industries attract the most talented workers, crowding out alternative entrepreneurship. Sachs and Warner's findings became widely accepted. A few dissenting voices argued their methodology was flawed. By measuring natural resource exports as a share of total exports, Sachs and Warner had measured natural resource intensity or dependence rather than abundance. These measures are not the same thing. Sachs and Warner also examined a period when commodity prices fell rapidly, so it was perhaps unsurprising that countries dependent upon natural resources grew slowly at such a time. This paper uses Sachs and Warner's methodology for the period 1995-2010 and finds no evidence of the resource "curse" over the more recent period. Possible reasons for this finding are examined. It is found there is no longer evidence that natural resource abundant countries are more prone to experiencing Dutch Disease. Secondly, the paper corrects for Sachs and Warner's use of resource intensity by providing an alternative measure of resource abundance. Using the World Bank's measure of the value of subsoil assets it finds no evidence of the resource "curse" for either the Sachs and Warner time period (1970-1990) or for 1995-2010.

JEL Classification: L71, N50, O13, Q30
Key words: Natural resources; resource curse; Sachs and Warner; Dutch Disease; resource abundance

1. INTRODUCTION

That countries should benefit from an abundance of natural resources endowment seems a logical conclusion. It is implied by the production function where the usual factors of production (labour and capital) can be expanded to include land and other natural resources.

The early growth of countries such as the US, Canada, Australia and more recently Botswana all seemed to support the conclusion that abundant natural resources provide an advantage for economic growth. Habakkuk (1962) concluded that the great natural resource abundance of the United States helped explain why it surpassed the United Kingdom economically in the 19th century.

Hence, the findings by Sachs and Warner (1997 & 2001) that the empirical reality is that resource-poor countries outperform resource-rich ones came as a surprise.

2. LITERATURE REVIEW

Sachs and Warner (1997) noted that outperformance of resource-poor countries is not a new phenomenon. In the seventeenth century, in spite of Spain's inflows of resources from its colonies, it was overtaken economically by resource-poor Netherlands. The star performers of recent decades have been "the resource-poor newly industrialized economies of East Asia - Korea, Taiwan, Hong Kong, Singapore – while many resource rich economies such as Mexico, Nigeria and Venezuela, have gone bankrupt" (Sachs and Warner, 1997: 3). They conclude that the possession of an abundance of natural resources has become synonymous with regions in the world that have experienced poor economic growth. Such regions suffer from the "Natural Resource Curse" (Sachs and Warner, 2001: 827).

Sachs and Warner (1997) showed that countries with high natural resource exports as a percentage of GDP (taking 1970 as the base year) grew slower in the following two decades than countries with low resource abundance. This was found to be the case even after controlling for additional variables claimed

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to be significant by other studies, hence, showing robustness. These variables included "initial GDP, openness policy, investment rates, human capital accumulation rates, changes in external terms of trade, government expenditure ratios, terms of trade volatility, and the efficiency of government institutions" (Sachs and Warner, 1997: 26).

Sachs and Warner (1997 & 2001) found the "curse" largely to be the result of two main occurrences: the prevalence of "Dutch disease" in resource-rich countries and the social and economic impact of the abundance of natural resources on a society.

"Dutch disease", so-named because it was first documented in Holland after the discovery and extraction of North Sea oil in the 1970s, refers to the phenomenon where the discovery and subsequent export of natural resources, such as natural gas, oil and minerals, leads to a valuation of the local exchange rate at a level higher than what allows for the development of other tradable industries in that country (Collier and Goderis, 2007: 16). Sachs and Warner (1997) state that in the presence of Dutch disease, production of tradables concentrates in the direction of natural resources as opposed to manufacturing. This is because capital and labour that would have been employed in manufacturing are instead drawn towards natural resources and non-traded goods. Thus the manufacturing sector shrinks and overall economic growth occurs at a slower rate (Krugman, 1987).

The negative social consequences of natural resource abundance are argued to stem from rent-seeking activities that take place as a result of natural resource abundance. According to Sachs and Warner (1997), generation of high concentrated economic rents is typical of natural resource production. One negative result is that special interest groups form with the aim of accessing these rents, in the form of government tax revenue from natural resources. These groups tend to impede innovation, thus slowing development.

A second negative result is that the high, concentrated rents lead to corruption and inefficient bureaucracies. In the case of the former, the temptation to plunder revenues seems insurmountable, while in the latter, "high rents distract governments from investing in the ability to produce growth supporting public goods" (Sachs and Warner, 1997: 9).

Auty (2001) adds that the slower industrialisation that results from the Dutch disease results in retarded urbanisation and so the accumulation of human as well as produced capital is further delayed, thus slowing growth. The resultant slow development of the labour market also means that a surplus of rural labour exists, contributing to income inequality and social strife.

Collier and Goderis (2007) found Sachs and Warner's findings to be sound, but concluded that while the combination of public and private consumption, total investment and exchange rate overvaluation explained a substantial part of the resource curse, individually none of them do.

Mehlum, Moene and Torvik (2006) confirmed the existence of the resource curse over a slightly longer time period (1965-90) than that used by Sachs and Warner (1997).

Subsequent studies by van der Ploeg and Poelhekke (2009), Ding and Field (2005), Alexeev and Conrad (2009), and Brunnschweiler (2008) found Sachs and Warner's (1997, 2001) conclusions to be not as robust as first thought.

Possibly the biggest point of contention with the Sachs and Warner thesis has to do with the use of the word 'abundance' as opposed to 'intensity', and the implications of this in describing the natural resource curse. The aim of Sachs and Warner's (1997, 2001) research was to prove, empirically, the existence of a negative relationship between natural resource abundance and economic growth. According to Hausmann and Rigobon (2002) and Ross (2013) this "curse" effect of natural resource abundance has been the focus of numerous resource and developmental research papers over the last few decades. Most of the subsequent research in this area has followed Sachs and Warner's use of primary exports divided by a measure of national income, as an indicator of natural resource abundance. This measure of resource intensity "is easily available and has been employed by numerous researchers who confirmed the negative growth effects of natural resource wealth" (Brunnschweiler, 2008: 399).

According to Brunnschweiler (2008) to use resource intensity when researching the "curse" and then, having found a negative relationship between it and economic growth, conclude that the curse does exist, is methodologically faulty. First, in order to conclude on the impact of natural resource abundance, the best proxy or closest approximation for measuring such abundance should be used. Using natural resource exports as that proxy assumes a strong positive relationship between natural resource abundance and natural resource exports which, even if true, has a number of important exceptions. For example, Australia and Germany, which are resource-rich countries, have low primary exports as a share of GDP (Brunnschweiler, 2008). Furthermore, this measure allows for the plausible argument that a large ratio of primary resource exports to GDP reflects the case of an overly specialized economy. Thus the resulting slow growth in a country that has a large proportion of primary exports, could be the result of poor economic policy which led to dependence on the natural resource sector (or any other sector for that matter) and may not be the result of a resource "curse" that affects natural resource abundant countries.

Second, resource exports, and hence primary exports as a percentage of GDP, are volatile because natural resource prices are volatile. Thus, the fact that resource dependence was measured at the beginning of the period and not as an average of the period being studied makes it even more unfit as a proxy of resource abundance (Lederman & Maloney, 2007: 19).

Sachs and Warner (1997) and Davis (2012) in arguing robustness use other measures of resource intensity in their regressions, namely: a measure of a country's mineral production as a share of GDP; a measure of the share of primary resource exports in total merchandise exports; and a log measure of the ratio of land area to population. Even with these measures, they argue that resource intensity remains significant in causing low growth levels. However, these measures further elucidate the fact that intensity had become the focus and not abundance in that they (excluding land) are measures of activity and hence flow, and do not seem to take into account the resources still 'in the ground'. Land may initially seem to include this stock part of natural resource wealth, but land area should be relatively constant regardless how much exploitation takes place and so may not be a good measure of abundance as a result (Sachs and Warner, 1997: 31). Furthermore, the reason for land being a ratio that includes population is unclear.

Van der Ploeg and Poelhekke (2009) go a step further in highlighting the importance of the difference between resource intensity (or dependence) and abundance in that they argue that taking "resource abundance (i.e., stocks of natural resource wealth) rather than resource dependence (i.e., natural resource exports as a percentage of GDP) as an explanatory variable, leads to a positive rather than a negative effect of resources on growth" (van der Ploeg and Poelhekke, 2009: 727). These findings were supported by Brunnschweiler (2008) who found no evidence of a negative growth effect of natural resource abundance in cross-country estimations. Using newly released measures of natural resource wealth Brunnschweiler (2008: 404) instead found "a positive direct association with economic growth over the period 1970 - 2000").

Canuto and Cavallari (2012: 5) further support this argument using recent World Bank data on wealth and natural capital in that they fail to find conclusive evidence of the negative relationship between natural resource abundance measure in this way and income per capita levels.

The question being raised by van der Ploeg and Poelhekke (2009) is not one of semantics. What they are suggesting is that Sachs and Warner's (1997, 2001) measure fails to distinguish between countries that actually have high levels of natural resource endowment and those that have some natural resources but produce little else. This lack of alternatives may have nothing to do with the presence of natural resources. Thus it is possible using natural resource exports as a share of GDP to arrive at a low level of resource "endowment" for an economy like the US - which in fact has huge amounts of natural resources but consumes much of them locally and in addition has other very large sources of GDP. Likewise an economy with quite low levels of resource endowment could have a high level of natural resource exports as a share of GDP if it exports nothing else and has few other sources of GDP.

Van der Ploeg and Poelhekke (2009) further emphasise the influence of GDP (output) growth volatility as being quintessential to explaining the curse. This was ignored in the Sachs and Warner (1997, 2001) papers. In a study of 83 countries over the period 1960–2000, they found robust evidence for a strong and negative link between real exchange rate volatility and growth performance after correcting for initial output per worker, enrolment in secondary education, trade openness, government consumption, inflation, and even banking or currency crises.

Davis (1995), Brunnschweiler (2008) and Sachs and Warner (1997), however, concede that natural resources are not always a "curse". It is argued that the resource curse thesis is not an "iron law", but a strong recurrent tendency. It is further argued that it can and has been avoided with careful mineral windfall management and appropriate policy implementation. Botswana and Australia are obvious examples of both high growth and high resource dependence. Nevertheless, they conclude that most natural resource economies have performed poorly.

Torres *et al* (2013: 2) note that the finding that natural resources are a "curse" has become "a stylized fact". According to Davis (2012: 2), Sachs and Warner's 2001 paper, "is the most cited environmental and resource economics paper of the last decade". Testing whether their findings are in fact valid is the goal of this paper.

3. RESEARCH GOALS AND METHOD

This paper updates Sachs and Warner's (1997, 2001) findings for growth over the period 1970-90 by testing for the natural resource curse in more recent times (1995-2010). In addition, measures of both mineral "abundance" and mineral "dependence" are used for both time periods to test the importance of the criticisms of van der Ploeg and Poelhekke (2009) regarding Sachs and Warner's measurement of natural resource exports as a share of GDP.

Data for 214 countries were obtained from the World Bank (2013a and 2013b) for the periods 1970-90 and 1995-2010. The relationships between GDP growth and natural resource "dependence" using Sachs and Warner's measure of natural resource exports share of GDP are examined for both time periods. Using World Bank data, an alternative measure of natural resource "abundance" is applied to both time periods.

The results are then compared to what Sachs and Warner (1997) found for the period 1970-1990. The occurrence of the Dutch Disease is examined as a possible explanation of differences in the findings of this study.

Finally, the implications of the findings are discussed and recommendations for policy formulation are made on the basis of the findings.

4. FINDINGS

4.1 Resource dependence

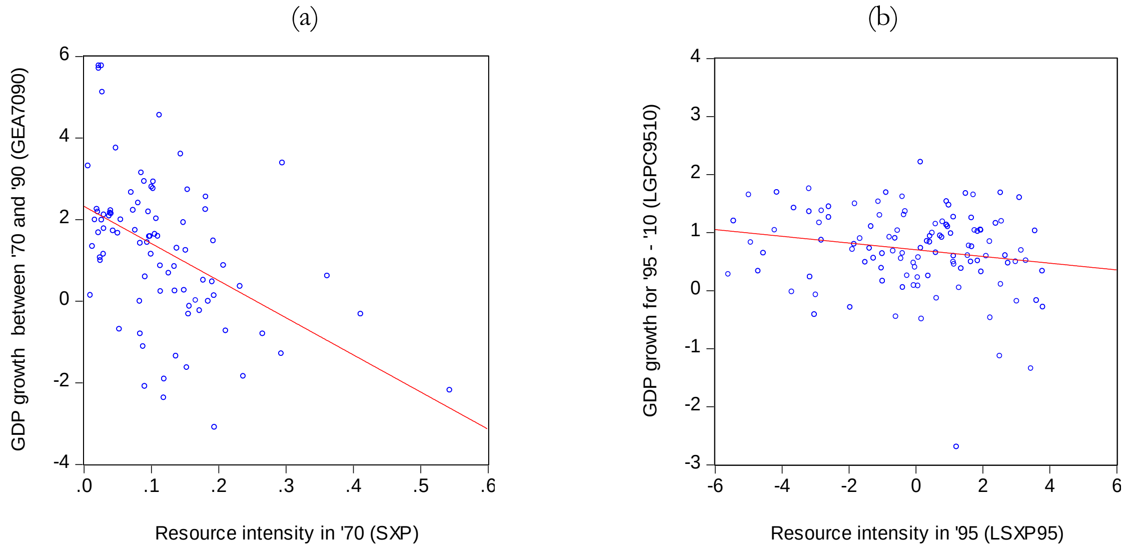
The results for resource dependence versus GDP growth are shown in Figure 1. Resource dependence is measured here as in Sachs and Warner (1997) as natural resource exports as a percentage of GDP. Natural resource exports are the sum of fuel and mineral exports as a percentage of GDP taken from the World Development Indicators (World Bank, 2013b).

Figure 1(a) reproduces the Sachs and Warner's (1997) results for the period 1970-90 using 1970 values for natural resource exports as a percentage of GDP. The relationship is clearly negative, suggesting the existence of the resource "curse".

The same methodology is applied in Figure 1(b) for the period 1995-2010 using 1995 measures of natural resource exports as a percentage of GDP. The relationship appears modestly negative but the results are insignificant (see Appendix A table A.2).

Reasons for the disappearance of this negative relationship in the more recent time period will be explored in section 4.3 below.

Figure 1: Resource dependence versus GDP growth

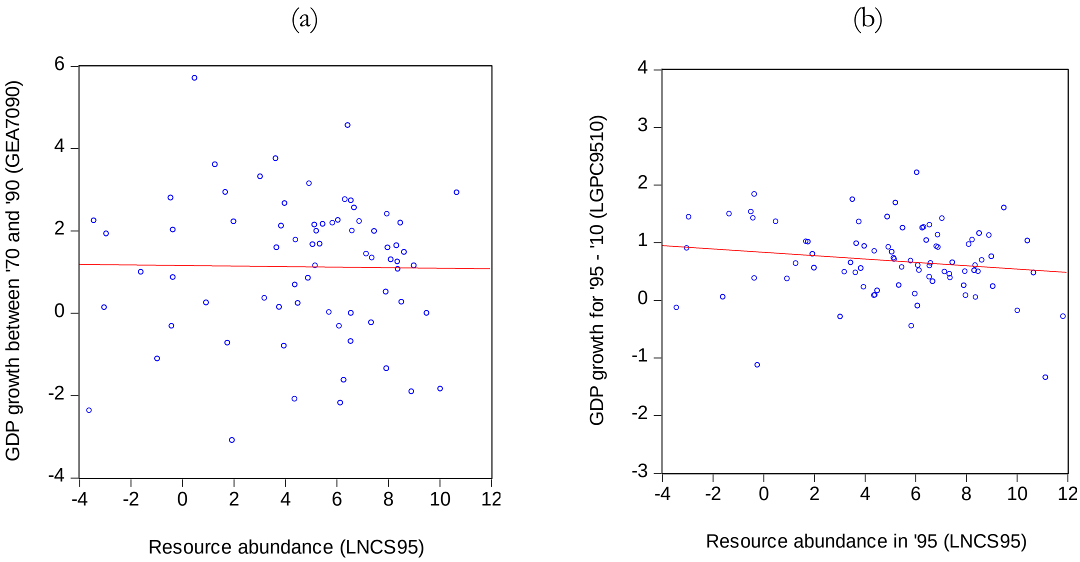


4.2 Resource abundance

In Figure 2, GDP growth over the periods 1970-90 and 1995-2010 are compared to resource "abundance". Resource "abundance" is measured as national subsoil assets, data for which is obtained from the "Changing Wealth of Nations" (World Bank, 2013a). Due to the fact that measures of subsoil assets are available only from 1995 onwards, the measure of the impact of resource abundance on GDP growth for the Sachs and Warner period (1970–1990) was made using the measure of resource abundance in 1995. Natural resource abundance (subsoil assets) data for 1995 was then also compared with GDP growth for the period 1995–2010.

The relationship between GDP growth and resource "abundance" is insignificant in both time periods. There is therefore no evidence of the resource "curse" when resource "abundance" rather than "dependence" is used. The results are shown in Appendix A tables A.1 and A.2.

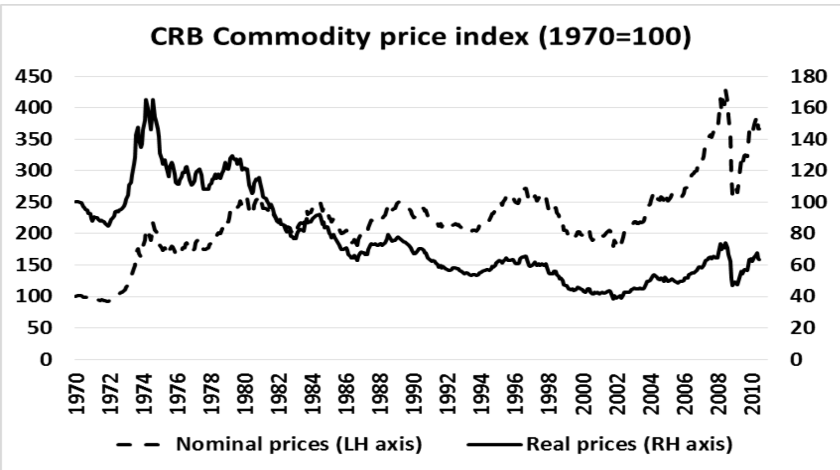
Figure 2: Resource abundance versus GDP growth



4.3 Dutch Disease

While the absence of the resource "curse" for either time period shown in Figure 2 can be explained by the use of the measure for resource "abundance" rather than "dependence", the disappearance of the "curse" over the period 1995-2010 even when using Sachs and Warner's measure of "dependence" requires explanation.

Figure 3: CRB Commodity Price Index – Nominal & real



A possible explanation is that commodity prices were falling in the Sachs and Warner time period but rising in the more recent time period. This is only partly correct. Figure 3 shows global commodity prices measured by CRB index of prices in both nominal terms and deflated by US inflation. Commodity prices rose strongly at the start of the Sachs and Warner time period but fell steadily in real terms from 1975 to 1990. For the more recent time period (1995-2010) commodity prices fell in real terms from 1995-2002 rose from 2003-2010. There was a sharp fall in 2008 as a result of the global financial crisis but by 2010 this fall had been reversed. While Sachs and Warner (1997 & 2001) claimed that their results were valid even after allowing for falling prices, it is possible that rising prices in the second half of the 1995-2010 time period contributed to a more favourable growth performance for commodity producing countries.

The second explanation for the absence of the "curse" in the period 1995-2010 is a much reduced relationship between resource dependence and Dutch Disease in this period.

For the period 1970-1990, Sachs and Warner measure the relationship between resource intensity and manufacturing exports as a percentage of total exports to test for the negative effect on manufacturing that characterizes the Dutch Disease. This method is replicated here for 1970-1990 and then applied to the period 1995–2010 to test whether there was a change in the negative effect on manufacturing exports associated with resource intensity and Dutch Disease. The method consisted of a cross-country (cross-sectional) regression analysis. Results can be found in table A.3 in Appendix A.

One limitation of this method is that the measure (manufacturing exports as a percentage of total exports) leaves room for an ambiguous final effect of Dutch Disease on the economy. This is because it is possible for a fall in manufactured exports as a percentage of total exports to be offset by an increase in total exports and vice versa. For example, if the total exports of an economy increased substantially, it is conceivable that even though the manufactured export share of total exports may have decreased, its absolute contribution to GDP may actually be larger than before. Hence the fall in manufactured export share may have in fact been an overall rise in its contribution to the economy. Thus table A.3 also includes a test of the relationship between resource intensity and manufactured exports as a percentage of GDP, which avoids this pitfall (see regression 6.3).

Regression 6.1 (Table A.3) shows the results obtained by Sachs and Warner which were replicated using their data. As can be seen, the results show that for the period 1970-1990 natural resource intensive countries experienced slower growth in their manufacturing exports as a percentage of total exports, holding constant the initial share. Regression 6.2 shows the same method applied for the years 1995-2010, though natural logarithms are taken. This regression reveals a negative but statistically insignificant coefficient. That the coefficient is statistically insignificant implies that for the period 1995-2010 the effect of resource intensity on the share of manufacturing exports as a fraction of total exports is not significantly different to zero, holding the initial export share constant and controlling for differences in total trade amount. This is a significant change from the effect found to be present during the period 1970-1990 discussed above.

Recalling the limitation of the measure of manufacturing exports as a percentage of total exports, also discussed above, regression 6.3 attempts to correct for possible off-setting of the total effect by instead using manufactured exports as a percentage of GDP as the dependent variable. For regression 6.3 a logarithmic relationship is again used due to its high interpretive power. This regression shows that when the total contribution of manufacturing exports to GDP is taken into account, there is in fact a small but significant positive coefficient of natural resource intensity. Specifically a country that is 1 percent more intense in its natural resource use had 0.22 per cent faster growth of its manufactured exports as a percentage of GDP. This finding is contrary to Dutch Disease expectations and warrants further study.

Thus it was concluded that the Dutch Disease had reduced in the period 1995-2010 from what it was in the period 1970-1990 and that this in part explains the difference in the resource curse effect found for the two periods.

Another possible way of measuring Dutch Disease would involve measuring overvaluation of a country's currency, as suggested by Sachs and Warner (2001). This was not performed however and could be a good test of the findings reported above. That similar results were found using both the "as a share of total exports" measure and the "as a share of GDP" measure (i.e. that the Dutch Disease effect measured via the effect on manufacturing export growth was not significant for the period 1995-2010) gives the findings some credibility.

5. CONCLUSIONS

The two major questions addressed in this paper are: (1) whether the resource curse as measured by Sachs and Warner (1997 & 2001) was still evident during the period 1995 to 2010; and (2) whether the criticism that Sachs and Warner used natural resource dependence rather than abundance influenced their results.

The findings for question 1 was that no resource curse was observed during the period 1995-2010 even when using Sachs and Warner's measure for resource dependence. In answer to question 2 it was found when using resource abundance that the resource curse effect was not significant in either time period.

The fact that Sachs and Warner (2007, 2011) made conclusions about the effect of natural resource "abundance" on economic growth even though their tests in fact used resource "dependence" or "intensity" as a proxy for abundance is therefore important. It was found that that for their focus period (1970-1990), the use of actual abundance measures (albeit for a later date) concluded that there was no negative (or positive) association between resource abundance and economic growth. This finding implies that the resource curse should not be defined as "slower economic growth occurring in more resource abundant countries" but rather "slower economic growth occurring in more resource intensive or dependent countries". Moreover the latter finding, while present in the period 1970-90, is no longer valid. The existence of the resource curse is thus valid even under their measure for only a particular time period.

For the period 1995-2010, there was no significant evidence of a natural resource curse effect whether it was defined as "slower economic growth occurring in more resource abundant countries" or "slower economic growth occurring in more resource intensive or dependent countries". Thus the concerns of van der Ploeg (2009), Canuto and Cavallari (2012) and Lederman and Maloney (2007) would appear to be justified.

That the resource curse effect was found to have fallen in the cross-country study for resource dependence implies that something must have changed globally to ensure that resource dependent countries are no longer as negatively affected by the resource intensity of their exports as they were in the period 1970-90. Tests were conducted for the continued presence of Dutch Disease in the 1995-2010 period. Examining the effect of resource intensity on the level of manufacturing exports produced, it was found that Dutch Disease under this measure had reduced compared to what was recorded in the period 1970-1990.

This study therefore suggests that better management of exchange rates by countries with high natural resource "dependence" is one possible cause of the disappearance of Dutch Disease. Reduced incidence of Dutch disease has in turn led to the disappearance of the resource 'curse" even when measure in terms of natural resource "dependence". Thus the possibility of prudent economic management turning resource intensity into an overall economic benefit – even for those countries that were clearly negatively affected by the resource curse in the past – is a real possibility.

APPENDIX A:

Table A.1: Natural resource curse measured using intensity and abundance between 1970 and 1990

Intensity

Dependent Variable: GEA7090

	Regression				
	1.1	1.2	1.3	1.4	1.5
LGDPEA70	-0.110637	-0.958065	-1.342321	-1.76092	-1.785918
	(-0.544841)	(-5.157812)	(-7.770891)	(-8.556013)	(-8.817758)
	[0.5873]	[0]	[0]	[0]	[0]
SXP	-9.433996	-6.955453	-7.29349	-10.56558	-10.26439
	(-4.744581)	(-4.545877)	(-5.573735)	(-7.01)	(-6.894098)
		[0]	[0]	[0]	[0]
SOPEN		3.059385	2.424366	1.328599	1.339819
		(8.052501	(-7.055561)	(-3.345092)	(-3.435122)
		[0]	[0]	[0.0014]	[0.001]
LINV7089			1.245189	1.016553	0.813949
			(-5.631897)	(-3.447277)	(-2.629154)
			[0]	[0.001]	[0.0107]
RL				0.35804	0.403976
				(-3.537415)	(-3.94351)
				[0.0008]	[0.0002]
DTT7090					0.086424
					(-1.849054)
					[0.0691]
Adjusted R-squared	0.199269	0.545048	0.667942	0.723481	0.733403
No. of obs.	87	87	87	71	71
S.E. of regression	1.620258	1.221304	1.043393	0.933918	0.917011
F-statistic	11.70094	35.34362	44.24778	37.62944	33.0947

Abundance

Dependent Variable: GEA7090

	Regression				
	2.1	2.2	2.3	2.4	2.5
LGDPEA70	0.1856618	-0.847159	-1.153655	-1.351926	-1.371995
	(0.8307455)	(-3.939152)	(-5.625054)	(-4.852972)	(-5.105555)
	[0.408686]	[0.0002]	[0]	[0]	[0]
NCS95	-0.000021	0.000008	-0.0000025	-0.000004	-0.0000184
	(-0.577216)	(0.278053)	(-0.101205)	(-0.153852)	(-0.719711)
	[0.5654772]	[0.7817]	[0.9197]	[0.8782]	[0.4745]
SOPEN		3.280778	2.678345	2.047425	2.007905
		(7.721225)	(6.613718)	(3.993676)	(4.059872)
		[0]	[0]	[0.0002]	[0.0001]
LINV7089			1.129188	0.929869	0.597066
			(4.407306)	(2.375128)	(1.482534)
			[0]	[0.0207]	[0.1434]
RL				0.258865	0.339738
				(1.909289)	(2.514699)
				[0.0609]	[0.0146]
DTT7090					0.145666
					(2.37053)
					[0.021]
Adjusted R-squared	-0.0154261	0.423467	0.535962	0.479892	0.516506
No. of obs.	80	80	80	67	67
S.E. of regression	1.7494082	1.318193	1.182616	1.210728	1.167335
F-statistic	0.3999241	20.34202	23.81117	13.17936	12.75108

The figures in curved brackets are t-statistics while the figures in block brackets are p-values.

Table A.2: Natural resource curse measured using intensity vs. using abundance between 1995 and 2010

<u>Intensity</u>

Dependent Variable: LGPC9510

	Regression				
	4.1	4.2	4.3	4.4	4.5
LGPC95	0.206725	0.225013	0.184666	-0.01699	0.064514
	(2.12942)	(2.342436)	(1.961806)	(-0.134808)	(0.423745)
	[0.0362]	[0.0216]	[0.0533]	[0.8942]	[0.6787]
LSXP95	-0.035479	-0.040486	-0.007667	-0.00133	-0.002306
	(-1.063634)	(-1.227111)	(-0.227017)	(-0.028186)	(-0.03378)
	[0.2906]	[0.2233]	[0.821]	[0.9778]	[0.9736]
OPEN		0.053133	-0.13178	-1.341613	-1.437143
		(0.398445)	(-0.929834)	(-5.352394)	(-4.571285)
		[0.6913]	[0.3553]	[0]	[0.0005]
LINV9510			0.767076	1.194014	1.55036
			(3.158859)	(3.615695)	(3.866724)
			[0.0022]	[0.0018]	[0.0019]
LRL05				1.318431	0.334062
				(1.809464)	(0.361844)
				[0.0862]	[0.7233]
LDTT9510					0.032612
					(0.058451)
					[0.9543]
Adjusted R-squared	0.038667	0.042823	0.125161	0.687451	0.728538
No. of obs.	85	87	84	25	20
S.E. of regression	0.659594	0.659617	0.632329	0.501369	0.51484
F-statistic	2.689334	2.28251	3.968637	11.55761	9.498581
F-statistic p-value	0.073917	0.08509	0.005498	0.000031	0.000397

<u>Abundance</u>

Dependent Variable: LGPC9510

	Regression				
	5.1	5.2	5.3	5.4	5.5
LGPC95	0.288327	0.289737	0.277601	0.229785	0.14442
	(4.218914)	(4.207024)	(3.816037)	(2.068957)	(1.338068)
	[0.0001]	[0.0001]	[0.0003]	[0.0541]	[0.2038]
LNCS95	-0.003662	-0.003316	-0.00452	0.00982	-0.018395
	(-0.205608)	(-0.184786)	(-0.248665)	(0.284341)	(-0.546626)
	[0.8377]	[0.854]	[0.8044]	[0.7796]	[0.5939]
OPEN		-0.048482	-0.074215	-0.482354	-0.765557
		(-0.393594)	(-0.559828)	(-1.53025)	(-2.37381)
		[0.6951]	[0.5775]	[0.1443]	[0.0337]
LINV9510			0.116812	0.085823	0.071486
			(0.543968)	(0.223311)	(0.179634)
			[0.5883]	[0.826]	[0.8602]
LRL05				0.619128	1.214678
				(0.823976)	(1.550697)
				[0.4214]	[0.145]
LDTT9510					-1.56099
					(-1.494798)
					[0.1588]
Adjusted R-squared	0.191874	0.181551	0.172725	0.244207	0.364671
No. of obs.	70	70	70	23	20
S.E. of regression	0.47166	0.474663	0.477215	0.498937	0.45401
F-statistic	9.191369	6.101929	4.6016	2.421701	2.817626
F-statistic p-value	0.000297	0.000996	0.002472	0.078467	0.055447

The figures in curved brackets are t-statistics while the figures in block brackets are p-values.

Table A.3: Dutch Disease Analysis

Dependent Variable: DMX7090 – Growth in manufacturing exports as a percentage of Total exports for 1970-1990		Dependent Variable: DMX9510 – Growth in manufacturing exports as a percentage of Total exports for 1995-2010		Dependent Variable: DMAN9510 – Growth in manufacturing exports as a percentage of GDP for 1995-2010	
Regression 6.1		Regression 6.2		Regression 6.3	
SXP	-0.46484	LSXP95	-0.110397	LSXP95	0.221805
	(-2.41744)		(0.298989)		(2.284047)
	[0.0178]		[0.7655]		[0.0251]
SOPEN	0.183842	OPEN	-0.737539	OPEN	-0.879897
	(3.479806)		(-0.49846)		(-2.363195)
	[0.0008]		[0.6196]		[0.0206]
SMX70	-0.45343	LSMX95	-2.663456	LMAN95	-0.097834
	(-4.75019)		(-4.984520)		(-0.228953)
	[0]		[0]		[0.8195]
Adjusted R-squared	0.18851	Adjusted R-squared	0.174620	Adjusted R-squared	0.081080
No. of obs.	89	No. of obs.	111	No. of obs.	82
S.E. of regression	0.183912	S.E. of regression	7.876619	S.E. of regression	1.814431
F-statistic	7.814167	F-statistic	8.757331	F-statistic	3.3823
Prob(F-statistic)	0.000115	Prob(F-statistic)	0.00030	Prob(F-statistic)	0.022

The figures in curved brackets are t-statistics while the figures in block brackets are p-values.

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