The Curse Of Natural Resources In The Transition Economies

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Abstract

The curse of natural resources is a well-documented phenomenon in developing countries. Economies that are richly endowed with natural resources tend to grow slowly. Among the transition economies of the former "Eastern Bloc", a similar pattern can be observed. This paper shows that a large part of the variation in growth rates among the transition economies can be attributed to the curse of natural resources. After controlling for numerous other factors, there is still a strong negative correlation between natural resource abundance and economic growth.

Among the transition economies the prime reason for the curse of natural resource is corruption. Other reasons for the curse of natural resources may be Dutch disease effect and a neglect of education.

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1 The Curse Of Natural Resources

The curse of natural resources is a well-documented phenomenon. Numerous researches, for instance Gylfason (2001), Sachs and Warner (1995), and Sala-i-Martin (1997), have found a significant negative correlation between natural resource abundance and economic growth. This finding seemed puzzling at first, because classical economic theory would predict that abundant natural resources should be good for the economy. As a matter of fact, economic theory in the 19th and early 20th century often regarded land as an important production factor, and land is a natural resource. In his famous "Essay on the Principle of Population", Thomas Malthus argued in 1798 that since land was a limited resource that does not grow, all other production factors would eventually run into diminishing returns, and thus economic growth would stop. Thus, a classical economist would expect that if one country has more natural resources than another otherwise similar country, the former would enjoy higher output per worker. Unless all countries in the world are in a steady state, this would translate into higher growth rates in countries that are relatively abundant in natural resources.

Empirical studies have shown that reality contradicted theory: The richest countries today are in general rather poorly endowed with natural resources. Among them are the Western European countries, whose economies are based on manufacturing and services, because they have little natural resources. Another example is the experience of several Asian economies, notably Japan, South Korea and Taiwan, which have shown that natural resources are not a necessary condition for rapid and sustained economic growth. None of the Asian tiger economies possesses significant natural resource endowments, but their average growth rates during the second half of the twentieth century have been higher than anywhere else in the world. South Korea and Taiwan achieved this even under difficult political circumstances.

The negative relationship between natural resource abundance and growth is not only found in case studies like those of the East Asian economies, but also in cross-country analyses. Sachs and Warner (1995), using the share of primary exports in GDP as a measure of natural resource intensity, examine a sample of 97 developing countries in the time period from 1970 to 1989 and find a significant negative correlation between GDP growth and the ratio of natural resource exports to GDP. Gylfason (2001) finds a negative relationship between the share of natural capital in total capital and economic growth. These findings provide evidence for the notion that a large endowment of natural resources leads to slower economic growth in a country.

This relationship is robust - even after controlling for a number of other variables, it persists. Sala-i-Martin (1997) tests 62 variables that are suspected to explain GDP growth and finds that the fraction of primary products in exports ranks among the top twenty of them in terms of robustness.

Confronted with these empirical findings, economists have developed theories that can explain the curse of natural resources. Some have argued that the findings might result from a bias in the indicator used, but Sachs and Warner (2001) test for possible bias[1] and find that the indicator they use, the share of primary exports in GDP, is unlikely to be biased. Most economists agree that there must be some sort of crowding out: If natural resources crowd out some activity X, and X is important for growth, then natural resources slow down growth. Plausible candidates for X include education, manufacturing, and sound government policy.

The transition economies of Eastern Europe and Asia provide an interesting case, because they began their transition period under similar circumstances around 1990. In all of them, communist regimes had ruled for decades and were now thrown over and replaced by more or less democratically elected governments. All of them faced similar difficulties as they ventured to make the transition from centrally planned economies to market economies. Although the initial conditions were rather similar in these countries, their growth rates diverged dramatically during the 1990s. Some of them recovered quickly from the initial shock and have enjoyed positive growth rates for the last few years. Others have seen their output drop to less than half of the level of 1989 and still have not recovered. It is possible that these tremendous differences in economic performance can be partly explained by the curse of natural resources, because natural resource abundance is one characteristic in which the transition countries differed strongly from the onset on: Some have oil and ores, some have not.

[1] A similar test is performed in Section 3 of this paper

This paper examines the effect of natural resource abundance on the growth performance of the transition economies of the former East during the 1990s. Section 2 delivers an overview of the existing literature on the curse of natural resources in general. Several sources are cited, providing evidence for the Curse that has been found in cross-country datasets containing mostly developed and developing countries. Some plausible explanations for the curse of natural resources are given. Section 3 is devoted to finding evidence for the curse of natural resources in the transition economies. A stepwise regression approach incorporating a wide range of plausible explanatory variables shows that natural resource abundance may be the most important factor explaining the growth differentials among the transition economies. In Section 4, the mechanism of the Curse is examined. Do natural resources lead to higher corruption, lower growth in manufacturing, and lower investment in human capital? And do these variables in turn affect growth? If so, how large is the effect? Section 5 forms the conclusion of this paper, summarising the main points and giving policy advice as well as suggestions for further research.

2 Possible Explanations For The Curse

Rent-Seeking And Corruption

The availability of natural resources tends to lead to massive rent-seeking in the government and the elite. Rent-seeking may take the form of tariff protection or outright corruption. This in turn leads to massive distortions of the economy and slows down growth. Natural resource abundance may also create a false sense of security in the people, as pointed out by Auty (2001). Necessary (and possibly painful) reforms of the labour market and other sectors are delayed because the country can survive on natural resource exports alone. Corruption always goes hand in hand with rents, because pressure groups may block political reforms in order to protect their rents. If there are no rents to be protected or captured, there is no need for corruption.

Why should rent-seeking behaviour be more common in countries where natural resources are abundant? Because the extraction of natural resources is usually controlled by huge corporations or state authorities. Natural resources are not produced in a competitive market environment. There are, so to say, huge barriers to entry. In contrast to manufacturing or services, it is simply not possible for private investors to start up a natural resource extraction company. The companies that exist often hold a monopoly position or are part of a cartel. Because of the need for acquiring mining concessions, there are close ties between the state authorities and the companies.

Natural resources are often found in areas that are not easily accessible and rather thinly populated. In contrast to manufacturing and service industries, which are typically situated in populated areas, natural resource production has to take place where the resources are, and these are often in unfriendly regions. The rule of law is not very strong in these areas.

In the case of Russia, the communist regime in some cases constructed whole cities just to provide housing for the workers in natural resource extraction. In such regions, the local natural resource producer has a monopsony position in the labour market, because there is no other employer in the region. This puts workers into a dependent position.

Company managers then have considerable leeway to do whatever they want. This makes them extremely vulnerable to bribery and other forms of illegal behaviour.

The question is how corruption influences the growth rate of the economy. Some economists have seriously and plausibly argued that corruption may actually increase efficiency and welfare. In the presence of other distortions, corruption and black market activity may be a second-best solution to the original distortions. If the state bureaucracy is weakly developed, bribes and speed money may actually improve the efficiency of the bureaucracy because they are used to “buy” decisions that are beneficial and urgent for someone who might otherwise have to wait for years. One has to keep in mind, however, that a second-best solution is worse than a first-best solution, and that the first-best solution would be to install the appropriate legislation, a powerful jurisdiction, and an efficient bureaucracy.

Corruption can create huge distortions in an economy. Since a bribe payment has to be kept secret, both bribers and bribees have to find ways to cover up the deal. Corrupt government officials and businessmen spend time and effort on hiding their activities. They could use the same time and effort to work productively.

Another point is that bribe payments are usually not used in efficient ways. A corrupt official cannot take his bribe receipts to the capital market and use them to finance profitable investments, because others may ask questions where he got the money from. Bribe payments are hidden in safes and foreign bank accounts, where they are of no use for the domestic economy.

Bardhan (1997) argues that “corruption has its adverse effects not only on static efficiency, but also on investment and growth.” If bribes have to be paid in order to receive a permission to start a new business, this clearly reduces the incentive to invest. Countries with efficient bureaucracies collect fees and taxes, but they are set up in such a way that they do not (at least in theory) depress economic growth. Investments leading to negative profits in the short run are tax-deductible, but bribes are not. Thus, according to Bardhan, the negative effect of corruption on growth results mainly from a disincentive to invest. Corruption leads to low investment, and this in turn leads to slower growth.

Bardhan also argues that corruption does not only reduce the amount of investment, but also the composition of it. Even if the amount of investment is unchanged, it becomes less productive, because it is diverted into inefficient areas. If corrupt government officials divert the cement from road and bridge building to build their own palace, this cement still enters the national accounts as investment, but it will probably not contribute to economic growth.

A final point made by Bardhan is that entrepreneurship is discouraged by corruption. If it is frustrating to start a new business because there is a lot of red tape and bribe-paying involved, potential innovators may decide not to open their own business and work somewhere else.

Thus, there are good reasons to believe that natural resource abundance, by concentrating wealth and power in the hands of a small elite, fosters corruption and rent-seeking behaviour. This in turn depresses economic growth, because the incentive to invest is reduced, and the remaining investment is not used efficiently.

Crowding-Out Of Manufacturing

Sachs and Warner (2001) argue that the curse of natural resources must lie in the fact that natural resources tend to crowd out some activity X, which is crucial to economic growth. In their view, activity X is probably manufacturing. They explain how crowding-out of traded-manufacturing industries by a dominant natural resource sector can permanently depress economic growth: The benefits from the natural resource sector accrue to a part of the population that has no incentive to invest them productively. Instead, the export revenues are spent in such a way that the demand raises the prices of non-tradable goods and services, and especially wages. Since the manufacturing sector uses non-tradables and domestic labour as inputs for production, it will not be competitive on the world market.

In countries with few natural resources, by contrast, the manufacturing sector receives a larger share of the total export revenue. Since manufacturing is a relatively competitive sector, the money is spent efficiently: It is invested in new capital and new technologies. This raises the productivity of labour. Output grows, wages rise, and capital owners earn a fair return on their investment. There may also be technological progress in the form of learning-by-doing. If this mechanism does not work, there is no growth throughout the whole economy.

In other words, manufacturing may exhibit a positive externality to the economy, as Sachs and Warner (1995) point out. The problem in natural resource abundant countries is that the producers of manufactures do not capture the whole benefits from their activities. All they see is that due to high input prices, their competitiveness is low, and they close down their businesses. As a result the positive externalities, which would accrue to the country as a whole, are lost.

If this hypothesis is to be tested with empirical observations, the test requires some measure for the relative price of tradable goods. Unfortunately, such a measure is not directly available. Sachs and Warner (2001) solve this problem by calculating the ratio of a country's purchasing power parity exchange rate to its nominal exchange rate. This procedure should result in an unbiased estimator because the price of tradables is more or less equal everywhere, so the general price level can be used as an indicator. It is a weighted average of the prices of tradables and non-tradables.

Sachs and Warner (2001) then perform a test on the difference in price levels. They control for the fact that in more developed countries, the price level is generally higher than in less-developed ones. As a result, they find that there is indeed a positive relationship between natural resource abundance and the general price level. So far, the explanation is credible.

The question then is whether the higher price level really impedes export growth. Unfortunately, Sachs and Warner do not provide a test whether high price levels are really negatively correlated with export growth. Although one should expect that competitiveness suffers under high price levels, which would lead to lower export growth, it would be interesting to know the significance and the size of this relationship.

However, they do show that the contribution of the growth of manufacturing exports to overall economic growth was smaller in natural resource abundant countries. They derive a proxy for this contribution by multiplying the growth in value added from manufacturing exports over the whole time period times the share of manufacturing exports in GDP in the starting year. This proxy, they say, is negatively correlated with natural resource abundance.

In addition to the rise in the general price level, natural resource abundance may also increase exchange rate volatility. Many countries are richly endowed with only one or two specific natural commodities. They are not sufficiently diversified, so that a shock in demand for their main export goods can have huge impacts on their exchange rate. Exchange rate volatility obviously provides another impediment to the growth of manufacturing exports.

The facts mentioned above provide a credible explanation for the curse of natural resources: Exports of manufacturing grow more slowly than otherwise, and the manufacturing sector as a whole will grow more slowly because it also faces foreign competition in the domestic market. The crippling of the manufacturing sector slows down overall economic growth, partly because the positive externalities from manufacturing in the form of faster technological progress are lost.

Neglect Of Investment In Human Capital

A similar reasoning of crowding out can be applied for investment in human capital. If high wages make manufacturing unprofitable, they also reduce the attractiveness of investing in education. Gylfason (2001) argues that it is not the existence of natural resources per se that imposes a drag on growth, but rather the way governments deal with the issue. Using public expenditure on education as indicator, Gylfason finds a statistically significant relationship between natural resource abundance and low levels of educational effort. Counter-examples include Botswana and Norway. Other indicators also show a negative correlation between natural resource abundance and educational effort.

As a next step, Gylfason argues that education is important for economic growth. He finds clearly positive, but decreasing, returns to education. A positive relationship between secondary school enrolment and economic growth is found significant. Gylfason concludes that about half of the natural resource curse works through the education channel.

From a theoretical point of view, it makes perfect sense to expect that education has an impact on growth. First of all, human capital is a production factor just like physical capital. Therefore, investment in human capital is the same as investment in physical capital. Even the simple Solow model predicts that as long as a country is below its steady state, a higher savings rate will lead to faster growth, and most countries are not in their steady state in reality. An extended Solow model with both human and physical capital can explain a large part of the variation in growth rates that we observe among countries: There is conditional convergence because each country is converging towards its unique steady state, and hardly any country can be said to be in a steady state.

Furthermore, in endogenous growth theory, the level of human capital can have a huge impact not only on short-run growth but also on growth in the long run. If the speed of technological progress depends on the level of the human capital stock, and this is a perfectly plausible assumption, then the long-run growth rate of the economy also depends on the level of the human capital stock. The size of the effect of investment in human capital depends on the specification of the model and on the size of the parameters: If the stock of knowledge helps in gaining additional knowledge, and knowledge is produced by human capital, there may be increasing returns to human capital. In this case, the benefits from investing in education can be enormous.

On the other hand, additional knowledge may become more and more difficult to acquire once a high stock of knowledge exists. Then there could be decreasing returns to human capital, so the benefits from education are rather small.

3 Evidence For The Curse

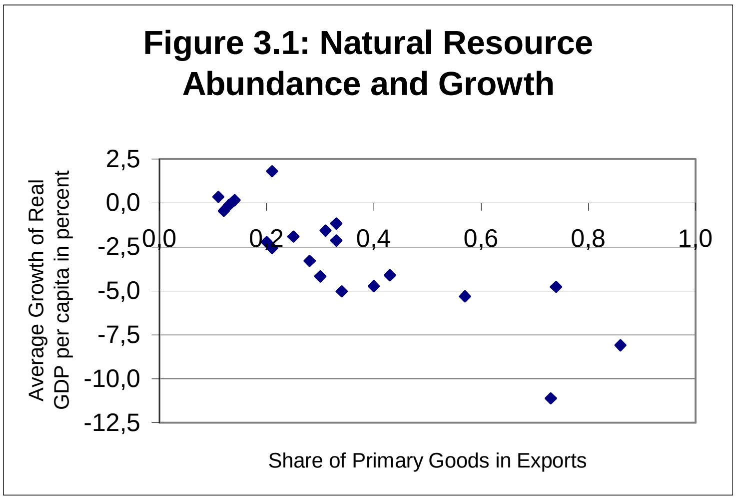
The Relationship Between Natural Resource Abundance And Growth

If we wish to examine the effect of natural resource abundance on growth, we need to find a measure for "natural resource abundance". Since the concept itself is somewhat vague, there is no unique measure for it. Even if there were such a measure, it would probably not be available for most of the countries being studied. Hence, we will have to rely on a proxy.

A statistic that is available for most countries are data on exports. Specifically, the share of primary goods in total exports can be calculated from official trade statistics, which should be relatively reliable. From the available data, this variable can be calculated for twenty of the transition economies, and we will call this variable ShaPrimEx.[2]

If the curse of natural resources also affects the transition economies, we observe a negative relation between natural resource abundance and per capita growth. Figure 3.1 plots the share of primary goods in exports against the growth of GDP per capita. As the curse hypothesis predicts, there is indeed a negative relation between these two variables. In fact, a glance at the figure gives any researcher a strong urge to run a regression of per capita growth on the share of primary goods in exports in order to test whether the immediate impression is supported by the data.

[2] Note that this measure is very similar to the one used by Sachs and Warner, the share of primary exports in GDP.



The result of this simple regression is shown in Table 3.1. The dependent variable is average growth of real GDP per capita, and the independent variable is the share of primary goods in total exports. We find a p-value close to zero, so we can say without exaggeration that we have found strong evidence for the curse of natural resources. Furthermore, the adjusted R^2 is close to 70 percent. This means that the share of primary goods in total exports can explain two thirds of the variation in per capita growth among the transition economies.

Table 3.1: The Effect of Natural Resource Abundance on Growth

Dependent variable	AvGroRGDP			
Multiple correlation coefficient	0,828530837			
R²	0,686463348			
Adjusted R²	0,669044645			
Standard Error	1,729683513			
Observations	20			
	Coefficient	*Standard Error*	*t-statistic*	*p-value*
Intercept	0,96947695	0,74587242	1,29978924	0,21007313
ShaPrimEx	-11,4553822	1,82477286	-6,27770309	6,4137E-06

Test For Omitted Geography Bias

Sachs and Warner (1997) admit that one possible explanation for the Curse could be that the results were simply biased. Some countries may have a more favourable geography than others. In such a case, if all countries were equally endowed with natural resources in 1900, but differed in their geographic situation, they would have different growth rates. By 2000, those countries with a favourable geography would be relatively rich, and the others would be relatively poor. The share of natural resources in GDP would be higher in the poor countries simply because the total economic size of these countries would be smaller. We would then find a negative correlation between economic development and natural resources, and conclude falsely that natural resources had slowed down growth.

In order to test for this possibility, Sachs and Warner propose a simple test, arguing that if there is an omitted variable like geography, the countries with favourable geography will always grow faster than others, not only in the time period being analysed. This possibility can be tested for by including the average annual growth rate of previous periods as an additional variable in a regression. Following the reasoning of Sachs and Warner, we can test for omitted geography bias in the sample of the transition economies by including average growth in the decade before the transition in a regression.

Table 3.2: Test for omitted geography bias

Dependent variable	AvGroRGDP
Multiple correlation coefficient	0,8809112
R^2	0,77600455
Adjusted R^2	0,74965214
Standard Error	1,52825473
Observations	20

	Coefficient	*Standard Error*	*t-statistic*	*p-value*
Intercept	2,12297159	0,81360618	2,60933561	0,01832268
ShaPrimEx	-11,0407386	1,66802137	-6,61906305	4,3445E-06
Growth8089	-0,51002617	0,24796792	-2,05682323	0,05538458

Table 3.2 shows the result of such a test. The additional variable is average GDP growth between 1980 and 1989.[3] The export share of primary goods is still highly significant, so the curse hypothesis easily survives this test.

[3] Ideally, one would use per capita growth, if such a data were available. However, although population growth rates are not known, they were probably low, so GDP growth should serve well enough as a proxy.

A somewhat surprising result of this test is that the coefficient on growth in the 1980s is negative and rather significantly so. Apparently, countries that enjoyed high growth in the 1980s tended to grow slowly in the 1990s. This observation is rather puzzling, and it could be an interested topic for future research.

Robustness Analysis

The results so far are rather interesting, and they seem to provide strong evidence for the curse hypothesis. However, it is possible that the seemingly strong negative relation between natural resource abundance and growth that we find in a simple regression vanished in a multiple regression containing more variables. Table 3.3 shows the results of a multiple regression containing the export share of primary goods plus a number of other plausible explanatory variables.

Table 3.3: Regression 1

Dependent variable		AvGroRGDPpC		
Multiple correlation coefficient		0,93478710		
R^2		0,87382692		
Adjusted R^2		0,77288845		
Standard error		1,49514695		
Observations		19		
	Coefficient	*Standard error*	*t-statistic*	*p-value*
Intercept	-0,34994036	21,4480685	-0,01631571	0,98730346
ShaPrimEx	-9,00565611	2,44982414	-3,67604187	0,00427423
LOG(RGDPpC89)	3,40778512	1,71367960	1,98857775	0,07479748
TradLib	0,40729916	0,40256091	1,01177028	0,33550217
LOG(CapForm)	-7,77819003	4,26033497	-1,82572265	0,09785768
SCI	2,97926160	5,38629211	0,55311920	0,59233128
LOG(SecEnrol90)	-2,13034308	10,7264525	-0,19860649	0,84655026
ExGro9499	0,18349003	0,06919611	2,65173917	0,02424058
PopGro8999	1,11799161	0,82056184	1,36247088	0,20294476

The most interesting number in Table 3.3 is of course the p-value of ShaPrimEx, because it indicates the significance of the export share of primary goods. We find that the p-value is higher than in the simple regression, but it is still lower than one percent. By any reasonable standard we can say that the export share of primary goods is significant.

Let us take a closer look at the other variables that are included in the regression, why they might be important, and whether they are significant. Real GDP per capita in 1989 is included to test for convergence. Many growth models predict convergence, implying that countries with a high GDP per capita in 1989 should tend to experience low growth in the 1990s. Apparently, this was not the case among the transition economies. The coefficient of LOG(RGDPpC89) is positive, and with a p-value of 7.5 percent, it may even be significant. If this is the case, it would indicate that there was actually some *divergence* instead of convergence among the transition economies.

TradLib is an index of trade liberalisation. Most transition economies implemented trade liberalisation policies during the 1990s, but the pace of these reforms differed very much.. Since numerous studies have shown that free trade can have a significant impact on growth (think of Sachs and Warner's openness index), one might expect a positive relationship between the pace of trade liberalisation and growth. In line with this expectation, the coefficient on TradLib is positive, but it is not very significant.

Capital formation (as a percentage of GDP) is included because it may also have an impact on growth. In the language of growth theory, all the transition economies were out of their respective steady states in the beginning of the 1990s, and under such circumstances, savings may have a huge impact on growth. Therefore, it is rather surprising that we find a negative coefficient on this variable. Fortunately, it is not very significant, and we need not pursue this topic here.

SCI (state corruption index) serves as a proxy for corruption, which is admittedly hard to measure. Intuitively, corruption is probably not good for the economy, so we might expect a negative coefficient on this variable. In this regression, however, the coefficient on SCI has the wrong sign and is insignificant. We will see later that the reason for this is the high correlation between ShaPrimEx and SCI.

Enrolment in secondary schools is included as a proxy for human capital. The growth literature has found several arguments why human capital may be important for growth, but in the case at hand, it appears to be rather insignificant.

Export growth has also been identified as a potential source of overall economic growth. As we would have expected, the coefficient of ExGro9499 is positive and quite significant.

The final explanatory variable in this regression is population growth. Since the days of Thomas Malthus economists have discussed extensively the impact of population growth on the growth of income per capita, and the dominant view is that under almost all circumstances the impact is negative. The regression at hand does not provide support for this view, because the coefficient on PopGro8999 is positive. However, it is not very significant, and even if it were significant, it would not inform us about the direction of causality.

Finally, the adjusted R^2 is about 77 percent, which is rather high for a cross section analysis. This indicates a good fit of the regression, and it suggests that the most relevant variables are indeed included in the regression.

So far, the Curse hypothesis appears credible even when a number of other relevant variables are included. However, regression 1 contains some highly insignificant variables. If we wish to know which variables have really had a significant impact on growth, a possible strategy is to perform a stepwise regression, excluding one irrelevant variable after the other until only the significant variables remain.

Table 3.4: Stepwise Regression Results

Regression	1	2	3	4	5
R^2	0,873827	0,873329	0,866161	0,849142	0,836822
Adjusted R^2	0,772888	0,792721	0,804389	0,795264	0,793308
Intercept	-0,34994 (0,98730)	-4,45828 (0,42774)	-4,53763 (0,39053)	-3,55013 (0,50324)	-2,82826 (0,59074)
ShaPrimEx	-9,00566 (0,00427)	-9,09331 (0,00227)	-8,17260 (0,00068)	-8,48774 (0,00047)	-9,21668 (0,00010)
LOG(RGDPpC89)	3,40779 (0,07480)	3,44988 (0,05722)	3,03152 (0,05682)	2,14752 (0,12249)	2,41308 (0,08078)
TradLib	0,40730 (0,33550)	0,43229 (0,26163)	0,45577 (0,20841)	0,36942 (0,30304)	
LOG(CapForm)	-7,77819 (0,09786)	-7,99803 (0,06668)	-6,65841 (0,06685)	-4,78630 (0,14047)	-4,62605 (0,15311)
SCI	2,97926 (0,59233)	3,29748 (0,51594)			
LOG(SecEnrol90)	-2,13034 (0,84655)				
ExGro9499	0,18349 (0,02424)	0,18296 (0,01824)	0,16584 (0,00721)	0,15742 (0,01001)	0,14162 (0,01414)
PopGro8999	1,11799 (0,20294)	1,11962 (0,18098)	0,85122 (0,22097)		

Table 3.4 shows the results of such a stepwise regression. It reports the estimated coefficients on each of the explanatory variables and its respective p-value (in brackets). When we exclude one irrelevant variable after the other, we end up with the model of regression 5, which includes only four remaining explanatory variables, one of them being ShaPrimEx. These four variables together account for about 80 percent of the variation in growth rates, and ShaPrimEx is the most significant of them.

Model Refinement

The model of regression 5 is quite successful in the sense that it can explain a large part of the growth patterns in the transition economies, using only four explanatory variables. Some further refinements are possible, though.

So far we have assumed that export growth affects all countries in a similar fashion. The specification of the model suggests that an increase in export growth by one percent would have the same effect on growth in all countries. In reality, however, it is possible that export growth is more crucial in natural resource abundant countries than in others. The reason is that these countries are typically dependent on their export revenues to finance investment into new capital goods. As Szirmai (1997) explains, theories of dependent development argue that in countries that are very dependent on primary exports, the internal market is "disrupted" in the sense that there are few linkages between the primary sector and the rest of the economy. There is no continuous production chain from primary goods production to manufacturing. Instead, these countries export primary goods and import capital goods. External shocks, such as a worldwide economic downturn and a fall in demand for this country's exports, have a much stronger effect on these countries because the lack of export revenue causes a fall in investment. The domestic economy cannot make the capital goods itself. Without export revenues, the country cannot pay for capital imports, and investment falls. Since investment is crucial for future growth, a fall in export revenue can have a lasting effect on these countries' growth rates.

In countries with little primary exports, the effect of a fall in export revenue is not that strong. These economies are typically more diversified in the sense that capital goods are at least partially produced within the country. Export revenues are not spent primarily on capital goods, but also on consumption, so a fall in export revenues affects both consumption and investment proportionately. The effect of export growth on economic growth is thus less pronounced.

In order to allow for asymmetric effects of export growth, one can calculate an interaction variable to measure the effect of a combination of natural resource abundance and export growth. This interaction term is included in regression 6, where it is simply called "InterAction". It is defined as ShaPrimEx times ExGro9499.

Table 3.5: Allowing for Asymmetric Effect				
Dependent variable		AvGroRGDPpC		
Multiple correlation coefficient		0,93384342		
R²		0,87206354		
Adjusted R²		0,82637195		
Standard error		1,27272259		
Observations		20		
	Coefficient	*Standard error*	*t-statistic*	*p-value*
Intercept	-2,47744544	4,72064786	-0,52481047	0,60792592
ShaPrimEx	-12,343464	2,26133764	-5,45847898	8,427E-05
LOG(RGDPpC89)	2,00221671	1,19959798	1,66907309	0,11730256
LOG(CapForm)	-2,83711121	2,96101928	-0,95815357	0,35424066
ExGro9499	-0,02449239	0,09665392	-0,25340302	0,80364011
InterAction	0,43265706	0,22031713	1,96379219	0,06972951

Table 3.5 shows the result of including this interaction term. Compared to regression 5, adjusted R^2 has increased, which indicates that it was probably a good idea to include InterAction. Note that export growth is now insignificant. This finding suggests that the impact of export growth is indeed asymmetric; the effect is more pronounced in natural resource reliant countries.

After the inclusion of InterAction, export growth and capital formation are rather insignificant. Excluding these two insignificant variables[4], we end up with the refined model, the results of which are presented in Table 3.6.

[4] Once again following a stepwise regression technique. ExGro9499 is excluded first because it is highly insignificant. In this reduced model (Regression 7, not reported) LOG(CapForm) is still insignificant and is therefore also excluded.

Table 3.6: The Refined Model

Dependent variable		AvGroRGDPpC		
Multiple correlation coefficient		0,92709996		
R^2		0,85951433		
Adjusted R^2		0,83317327		
Standard error		1,24754617		
Observations		20		
	Coefficient	*Standard error*	*t-statistic*	*p-value*
Intercept	-5,1525964	4,02528521	-1,28005747	0,21877353
ShaPrimEx	-12,0397385	1,55460682	-7,74455528	8,4267E-07
LOG(RGDPpC89)	1,60229169	1,0890572	1,47126495	0,1606136
InterAction	0,37572511	0,1042608	3,60370443	0,00238051

What Table 3.6 shows is that we have found a model containing only three explanatory variables that is capable of explaining more than 80 percent of the variation in growth rates of the transition economies during the 1990s. The estimated coefficient on ShaPrimEx is negative and highly significant, with an extremely low p-value. The coefficient on RGDPpC89 is positive, suggesting that high initial income led to faster growth, but it is only borderline significant. InterAction is highly significant, supporting the notion that export growth has a positive, but asymmetric, effect on growth.

Thus, the conclusions of this section are:

1) There is strong evidence for the curse of natural resources in the transition economies.
2) Export growth had a positive impact on growth, and this impact was more pronounced in the natural resource abundant countries.
3) Natural resource abundance, initial income, and export growth together explain a large part of the different growth performances of the transition economies.

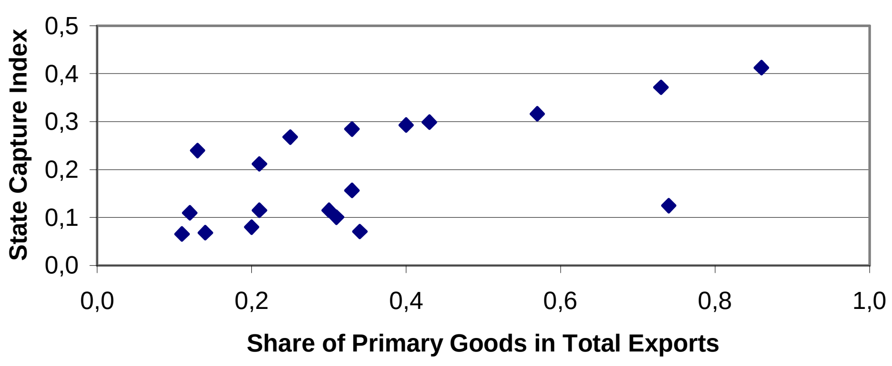
4 Reasons For The Curse

Having established that the curse of natural resources affected the transition economies, we can now move on and try to find out how the curse has worked. In Section 2 we have seen that there are three popular explanations for the curse: corruption/rent-seeking, crowding out of manufacturing, and neglect of education. Now we will examine whether these phenomena have also occurred in the transition economies, and if they have, we will estimate their effect on growth.

Rent-Seeking/Corruption

Corruption is difficult to measure because it is by definition not observable[5]. In this paper we use a "state corruption index" (SCI) from the Business Environment and Enterprise Performance Survey conducted by the World Bank in 1999. This index measures the extent to which decisions by the government, the central bank, and the courts can be, or have to be, "bought" by firms. The l arger the index, the greater the extent of corruption. In contrast to other corruption indexes, the State Capture Index is available for almost all of the transition economies, because the study was explicitly aimed at these countries.

Figure 4.1: Natural Resource Abundance and Corruption



[5] In practice, some corruption is observed, but this is only the "top of the iceberg".

Figure 4.1 plots the relation between SCI and the share of primary goods in total exports. At a first glance, the relation appears to be strongly positive. This impression is reinforced by the results from the corresponding regression, which are shown in Table 4.1. The p-value of ShaPrimEx is less than one percent, which means that there is a significant positive relationship between natural resource abundance and corruption. Countries that are natural resource abundant are plagued by corruption.

Table 4.1: Natural Resource Abundance and Corruption

Dependent variable		SCI		
Multiple correlation coefficient		0,63407624		
R^2		0,40205268		
Adjusted R^2		0,36687930		
Standard error		0,08913191		
Observations		19		
	Coefficient	*Standard error*	*t-statistic*	*p-value*
Intercept	0,08214085	0,03907924	2,10190517	0,05077224
ShaPrimEx	0,31881751	0,09429913	3,38091674	0,00355144

The relationship between natural resource abundance and corruption is now clear, but the question now is: Does corruption affect growth? To answer this question, look at Figure 4.2 and Table 4.2.

Figure 4.2: Corruption and Growth

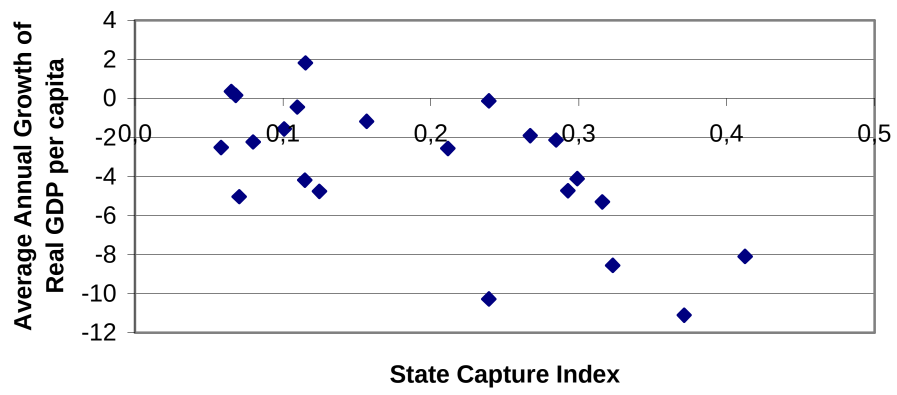


Table 4.2: Corruption and Growth				
Dependent variable		AvGroRGDPpC		
Multiple correlation coefficient		0,63023134		
R^2		0,39719154		
Adjusted R^2		0,36705111		
Standard error		2,76795297		
Observations		22		
	Coefficient	*Standard error*	*t-statistic*	*p-value*
Intercept	0,27828993	1,21333458	0,22935960	0,82091870
SCI	-19,5980626	5,39868293	-3,63015626	0,00166731

Both Figure 4.2 and Table 4.2 tell a clear-cut story: There is a highly significant negative relationship between corruption. In a simple regression of average growth on SCI, the p-value of SCI is below one percent, so it is clearly significant.

What does this tell us about the possible explanation of the curse? One argument is that abundant natural resources lead to high corruption, and high corruption slows down growth. In the data, natural resource abundance is associated with high corruption, and high corruption in turn is associated with low growth. These findings support the view that corruption is one reason for the curse of natural resources.

Crowding-Out Of Manufacturing

This phenomenon is also called “The Dutch disease” because it was observed in the Dutch economy after natural gas was discovered and extraction had begun on a large scale. In an economy that suffers from the Dutch disease, the revenues from primary exports raise the purchasing power of the economy. The additional wealth is at least partially spent on non-tradable goods and services. Since purchasing power parity does not hold for non-tradables, the price of these goods is free to rise even under free trade.

The rise in prices for non-tradables creates problems for the manufacturing sector: Among non-tradables are crucial inputs for manufacturing production, such as wages and rents for buildings. Due to the high input prices the manufacturing sector is internationally not competitive. Exports of manufactures thus grow slower. Depending on transport costs and tariffs, foreign producers may enter the market and drive prices down, so that domestic producers cannot compete. This would reduce the growth of the manufacturing sector as a whole.

Sachs and Warner (2001) argue that manufacturing may exhibit positive externalities for the economy as a whole. They say that in manufacturing, technological progress is achieved simply through learning-by-doing. In other sectors, there is less learning-by-doing. If this is true, the crippling of the manufacturing sector due to high price levels will have a lasting negative effect on growth.

Figure 4.3: Natural Resource Abundance and Relative Price Levels

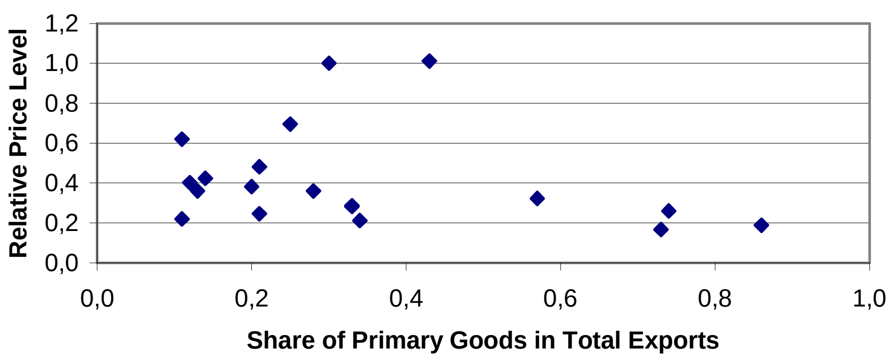


Figure 4.3 shows the relationship between natural resource abundance and relative price levels. From the figure, no obvious relationship is apparent. However, the regression results in Table 4.3 show that there is in fact a relationship between ShaPrimEx, but it is non-linear. The estimates imply that up to a value of 49% an increase in the share of primary exports increases the relative price level. Only four countries exceed this value, s in general we can conclude that natural resource abundance does increase the relative price level in a country.[6]

[6] The regression in Table 4.3 contains GDP per capita in addition to ShaPrimEx and ShaPrimEx². Theoretically, we would expect that in rich countries the price level is higher because of non-tradables such as services. This expectation is confirmed; the coefficient on GDPpC is positive and significant.

Table 4.3: Evidence for the Dutch disease

Dependent variable		RelPrice		
Multiple correlation coefficient		0,66328678		
R^2		0,43994936		
Adjusted R^2		0,31993851		
Standard error		0,20765056		
Observations		18		
	Coefficient	*Standard error*	*t-statistic*	*p-value*
Intercept	-0,34002636	0,31819167	-1,06862118	0,30332048
ShaPrimEx	3,1341004	1,32628839	2,36306103	0,03312783
GDPpC	7,9745E-05	3,043E-05	2,62057338	0,02015343
$ShaPrimEx^2$	-3,20235247	1,29137544	-2,47979973	0,02647932

Having accepted a positive relationship between natural resource abundance and relative price levels, we now have to examine whether a high price level has indeed negative consequences for growth. Figure 4.4 plots the relative price level against growth. A negative relationship is not apparent, but the graph suggests that there may be a non-linear relationship.

Figure 4.4: Relative Price Levels and Growth

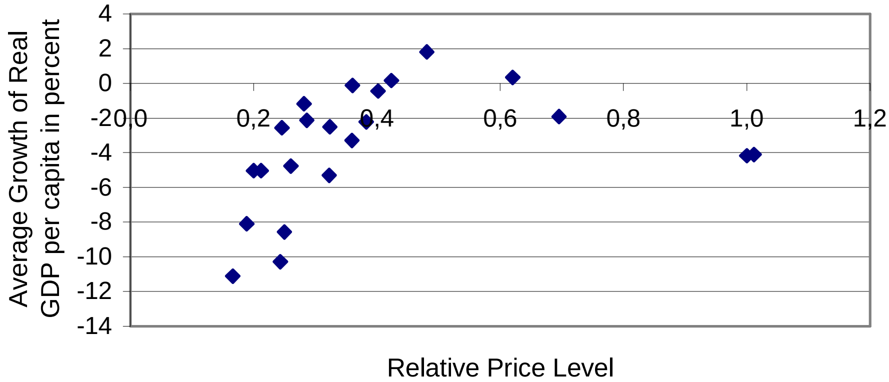


Table 4.4 confirms this impression. When we regress growth on relative price and its square, we find that there is a relationship between growth and the price level, and it is quite significant. The estimates imply that at low relative price levels (below 0,63) a rise in the relative price level is associated with an increase in growth. Since the relative price

level was well within the increasing range in most of the transition economies, we can conclude that in general high relative price levels are associated with slow growth. This finding is rather puzzling. Why should higher relative price levels be associated with faster growth? According to the Dutch disease hypothesis, higher price levels should actually slow down growth, but this has not been the case in the transition economies.

Table 4.4: Growth and Relative Price Levels II

Dependent variable		AvGroRGDPpC		
Multiple correlation coefficient		0,78805447		
R^2		0,62102984		
Adjusted R^2		0,58113825		
Standard error		2,23686642		
Observations		22		
	Coefficient	*Standard error*	*t-statistic*	*p-value*
Intercept	-16,3910391	2,33577078	-7,01740052	1,1081E-06
RelPrice	55,104516	10,1419674	5,43331621	3,0485E-05
$RelPrice^2$	-43,1806326	8,52862407	-5,06302449	6,9076E-05

Thus, we find rather mixed evidence for the Dutch disease hypothesis. Natural resource abundance is indeed associated with high relative price levels, as predicted by the hypothesis, but these higher price levels do not seem to have had a negative impact on growth.

Neglect of Investment in Human Capital

Gylfason (2001) finds that among developing countries, neglect of investment in human capital is one of the prime reasons that explain the curse of natural resources. In fact, the impact of neglecting education is so strong that "of the total effect of natural cap ital on growth, almost half can [...] be attributed to education...".

In traditional growth models, neither the rate of investment in capital nor the stock of capital influences long-run economic growth. This holds for human capital just as it does for physical capital. However, there are three reasons why one might suspect that investment in human capital could have had an impact on growth in the transition economies: Firstly, one decade is probably not what most growth theories mean when they are concerned with the "long run". And in the short run, a rise in the savings rate does speed up growth because the economy moves toward a new (higher) steady state. Second, the notion that the savings rate does not influence growth only holds if the economy is in a steady state, but the transition economies were definitely not in a steady state after 1989. They may have come from a steady state, but during the 1990s they were in transition towards a new steady state. Third, endogenous growth theory has shown that if technological progress is determined endogenously, investment in human capital may very well have an impact on long-run growth. Different models and different assumptions lead to different results, but in many cases the stock, or the growth of the stock, of human capital determines growth. One might argue that, since the transition economies are not at the technological frontier, technological progress is exogenous to them. But even in that case, they may still need human capital in order to understand and apply the knowledge that spills over from abroad.

Figure 5.6: Natural Resource Abundance and Secondary Enrolment Rates in 1990

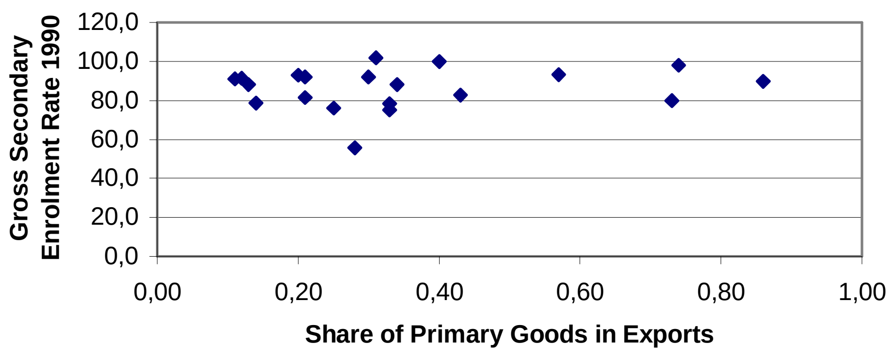


Figure 4.5 plots the share of primary goods in exports against secondary enrolment rates in 1990. There is no obvious relationship between these two variables. Over the whole range of the country sample, with ShaPrimEx varying between twelve percent and eighty-seven percent, there is no trend in gross secondary enrolment. The corresponding regression, reported in Table 4.5, confirms this observation.

Table 5.5: Natural Resource Abundance and Secondary Enrolment 1990

Dependent variable		SecEnrol90		
Multiple correlation coefficient		0,14468910		
R^2		0,02093493		
Adjusted R^2		-0,03345757		
Standard error		10,8296155		
Observations		20		
	Coefficient	*Standard error*	*t-statistic*	*p-value*
Intercept	83,8727567	4,66993613	17,9601507	6,1163E-13
ShaPrimEx	7,08796376	11,4249736	0,62039213	0,54277538

In this respect, the transition economies differ starkly from developing countries. In developing countries, the relationship between natural resource abundance and education is significant and quite strong. Gylfason (2001) finds that "an increase in the natural capital share by five percentage points goes along with a decrease by 10 percentage points in the secondary school enrolment rate..." If this relationship would hold in the transition economies, with their enormous differences in natural resource abundance, we should observe huge variations in secondary enrolment rates.

One reason may be that prior to 1989, investment in education was not based on market incentives, but on ideological ones. The neglect of human capital investment in natural resource abundant countries is usually explained by a crowding-out effect of the primary goods industries: If unskilled workers can earn a reasonable wage in the primary goods sector, they have little incentive to invest in education. High wages in the primary sector crowd out investment in human capital. This influences the decisions of individuals as well as the government. Individuals consider the alternative between working at a reasonable wage and going through long years of unpaid and unpleasant education. Limited access to schooling especially in the countryside might also require moving to another city. The government in turn has little incentive to invest heavily in education as long as the economy can live off the primary goods sector fairly enough. There may even be lobbying from the natural resource industry against education programmes because they may prefer cheap unskilled workers to expensive skilled ones.

In the centrally planned economies, things were different: There was no crowding out of investment in human capital because of the distorted prices. Schooling was essentially free and widely available. Therefore, individuals went to school happily. Governments also had incentives to massively subsidise education for both ideological and pragmatic reasons. In an idealistic view, one may argue that there was still the socialist ideal of a classless society. Necessary for the classless society was obviously an equally educated workforce. Differences in the access to education would again increase social differences and lead to class-building.

In a more pragmatic view, Soviet leaders stressed the need for education in their quest for technological supremacy over the West. Even in the 1980s, when the communist countries had fallen far behind in terms of living standards and economic development, they were still renowned for considerable scientific achievements. The basis for the communist countries' strength in science was their heavy investment in education. For all these reasons, secondary enrolment rates in most communist countries were close to the maximum of one hundred.

If the above reasoning is true, one would expect that during the transition towards a market economy the mechanism that causes the negative relationship between natural resource abundance and educational efforts begins to take effect. However, evidence for this view is not easily found. Even with the most recent reliable data on secondary enrolment (from 1997) the statistical relationship between natural resource abundance and secondary enrolment is weak.[7] The picture looks a bit different when we use the change in secondary enrolment rates, rather than its absolute value.

Table 5.6: Natural Resource Abundance and The Change in Secondary Enrolment Rates

Dependent variable		SecEnrolChng		
Multiple correlation coefficient		0,506801288		
R^2		0,256847545		
Adjusted R^2		0,169417844		
Standard error		2,594583958		
Observations		20		
	Coefficient	*Standard error*	*t-statistic*	*p-value*
Intercept	4,264613895	2,316632847	1,840867404	0,083162510
ShaPrimEx	-24,08099180	12,31825135	-1,954903430	0,067241389
$ShaPrimEx^2$	20,61066025	12,98248449	1,587574417	0,130806711

[7] A regression of secondary enrolment rates in 1997 on ShaPrimEx yields a negative coefficient for ShaPrimEx and a p-value of slightly more than 10 percent. This provides some weak evidence for the view that natural resources affect enrolment rates, but it is not very convincing.

Table 5.6 reports the results of a regression of the change in secondary enrolment rates between 1990 and 1995. One can see that there is a negative association between natural resource abundance (the effect of ShaPrimEx is negative for small values of ShaPrimEx), but the p-value of 6.7% is not very convincing. What we can conclude is that there is weak evidence for the view that natural resource abundance crowds out education.

It is quite likely that in the future the negative relationship between natural resource abundance and educational efforts will become more obvious. In Table 5.6 we have seen that there is weak evidence for a trend; in natural resource abundant countries secondary enrolment rates are falling on average. If this trend continues, the differences in secondary enrolment rates may become larger in the future.

Since we observe no strong relationship between natural resource abundance and enrolment rates we must conclude that at least for the first half of the 1990s education cannot be an explanation for the curse of natural resources. Indeed, there is no significant relationship between secondary enrolment rates in 1990, 1995, or 1997 and growth during the 1990s. However, we should not conclude that education has been unimportant. The point is that education can affect growth only with a time lag. The time period being studied in this paper is simply too short to reflect the long-run effects of investments in education. We have found some evidence that education may have been neglected in the natural resource abundant countries, and we should expect this neglect of education to have adverse consequences in the future.

5 Conclusion

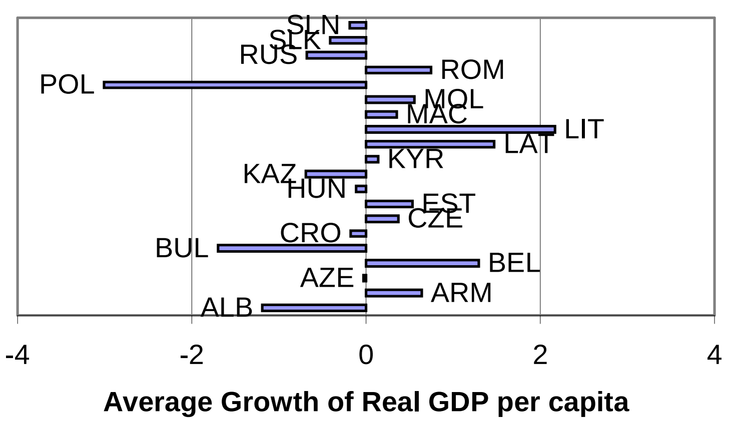
The Curse Exists

There can be little doubt that among the group of transition economies studied in this paper, natural resource abundance is associated with slow economic growth. The evidence is surprisingly strong - those countries that are relatively abundant in natural resources performed very poorly in terms of economic growth. The countries that are less abundant in natural resources recovered from the shock of transition much more quickly and returned to "normal" (positive) growth rates after three or less years of transition. Among the CEE-5 countries, which outperformed all other transition economies, Poland has the highest share of primary goods in total exports: 21 percent in 1999. None of the CEE-5 is natural resource abundant. The countries that rank highest in terms of natural resource abundance are "growth disasters": Russia, with a primary export share of 57 percent, suffered negative GDP growth rates from 1990 to 1998. Moldova, with a primary export share of 73 percent, had negative growth rates throughout the last decade of the 20th century. These observations, eye-catching as they are, are no exceptions. Multiple regressions including a wide range of other explanatory variables show that natural resource abundance is statistically negatively correlated with economic growth. Natural resource abundance is one of the most powerful variables in explaining economic growth in the transition economies.

Aside from natural resource abundance, there are two other important explanatory variables: Real GDP per capita in 1989 and the growth of exports. Real GDP per capita in 1989 is positively correlated with growth in the 1990s. This may seem surprising, because usually, initial income is negatively correlated with subsequent growth, indicating conditional convergence. Among the transition economies there appears to be no conditional convergence. The level of GDP per capita in 1989 can be interpreted as a proxy for the general development level of an economy. Economies that were relatively well developed may have been in a better position to deal with the problems of transition than less developed economies. This may explain why relatively advanced economies, such as the CEE-5, managed to recover quickly. The less advanced economies, especially the outlying regions of the former Soviet Union, were less adaptive. This theory explains why initial GDP per capita is positively correlated with subsequent growth. The effect of export growth on GDP growth is more complicated. Export growth itself is positively correlated with economic growth, but the effect may not be symmetric in all countries. The interaction term used in the refined model indicates that the effect of export growth on output growth may be stronger in natural resource abundant countries than in other countries.

These three variables, natural resource abundance, initial GDP per capita, and export growth, together explain more than 80 percent of the variation in growth rates among the transition economies. Figure 5.1 shows how accurately the refined model from Table 3.6 can "predict" the growth rates of the transition economies.

Figure 5.1: Model Prediction Error



The model prediction error is the difference between the growth rate that the model predicts when one enters the variables for each country and the actual growth rate. For 13 out of the 20 countries for which the necessary data are available, the model prediction error is less than one percent. Only for two countries, Poland and Lithuania, the model prediction differs more than two percent from the actual value.

To sum up, natural resource abundance had a very significant negative impact on economic growth in the transition economies. In fact, it appears to have been the most important factor. Other important factors are the initial level of GDP per capita and export growth.

Corruption Is The Main Reason For The Curse

The reasons for the curse of natural resources have been summarised in Section 2. In the world of the transition economies, corruption seems to be the main driving force behind the curse: A state capture index, which measures the extent of corruption in the state bureaucracy, is closely correlated with natural resource abundance. This observation supports the theoretical argument that natural resource abundance tends to foster corruption.

In Section 4.1 we have seen that there is a strong negative correlation between economic growth and the extent of corruption in a country. This finding completes the chain of causality: Natural resources abundance leads to corruption, and corruption leads to slow economic growth. Of course, the relationship is not perfect. Corruption is not caused solely by natural resources. The heritage of the former communist regimes certainly also plays a role. The various approaches to privatisation also influenced the extent of corruption: The Czech mass privatisation programme, for instance, gave rise to massive corruption, and this may explain why the Czech Republic performed worse than the other CEE-5 countries. The Polish mass privatisation, by contrast, was much more successful, and this may explain partly why Poland performed relatively well.

The size of the effect is difficult to estimate because in order to do so, one needs to run a regression on growth with natural resource abundance and corruption as explanatory variables to discern the direct and indirect effects of natural resource abundance. Doing so leads to problems of multicollinearity, precisely because of the close correlation of natural resource abundance and corruption. The coefficient estimate of the corruption index then becomes very inaccurate. Future research might attempt to tackle this problem by using more sophisticated econometric methods like instrumental variables.

Dutch disease effects may also play a role in the transition economies, but the evidence is mixed. Controlling for GDP per capita, we observe a non-linear, but positive, effect of natural resource abundance on the relative price level of a country. According to theory, this relatively high price level should impose a drag on growth because it makes producers of manufactured goods incompetitive on the world market. We do not find a significant relationship between relative price levels and economic growth, so the Dutch disease hypothesis is not very convincing in the case at hand. Further research could aim at examining the growth of the manufacturing sector itself, if such data become available. In order to test whether there are indeed spillover effects from the manufacturing sector, one might also try find a relationship between manufacturing growth and TFP growth.

Neglect of investment in human capital, which accounts for a large part of the total curse of natural resources in developing countries, seems to have had little impact on the transition economies. The reason is probably the time lag associated with education. There is some evidence for the claim that natural resource abundant countries have tended to neglect education. However, most transition countries started in 1990 at similar rates of secondary enrolment as a heritage of the communist system, which emphasised the role of education. The neglect of education may lead to differences in secondary enrolment rates, but by 1997, the effect was not yet very pronounced. As a result, there is little evidence for an impact of educational effort on economic growth. Since countries do not (yet) differ significantly in terms of enrolment rates, different enrolment rates cannot be an explanation for different growth rates. However, there is reason to assume that over time, the neglect of education will have an impact on growth. If the trend of neglecting education in natural resource abundant countries continues, this will finally result in different enrolment rates. And these differences in turn may have an impact on growth.

Advice For Policy-Makers

What can policy-makers in the transition countries learn from this paper? That natural resources are bad for growth? Should they set oilfields on fire and demolish the gold mines?

The answer is of course No! As Gylfason (2001) puts it: "it is not the existence of natural wealth as such that seems to be the problem, but rather the failure of public authorities to avert the dangers that accompany the gifts of nature. Good policies can turn abundant natural resource riches into an unambiguous blessing."

So what can be done to overcome the curse of natural resources? The most obvious solution is easier said than done: Fight corruption. The data show that countries where corruption is widespread and common perform poorly in terms of economic growth. Of course, corruption is not easily rooted out by sheer willpower. Something needs to be done against corruption, and policy-makers should definitely put more emphasis on the fight against corruption. If corruption cannot be rooted out completely, a more centralised state structure may be a good idea. Centralisation by itself does not reduce corruption, but in a centralised bureaucracy, corruption may have less distortionary effects than in a decentralised system (Bardhan, 1997).

The positive effect of export growth on GDP growth also provides a useful hint. Policies that aim at increasing exports may have additional benefits. Most countries already pursue export-oriented economic policies. Membership in the EU may provide additional export growth. One might consider an industrial policy that targets especially the export-oriented manufacturing sector.

Another point is that education should not be neglected. The gains from education will accrue to the population with a time lag of more than a decade, which is why they are so often neglected by today's policy-makers, but they are huge.

A shining example of how to deal with extraordinary natural resource endowments is provided by Norway. In Norway, almost 90 percent of oil revenues are collected by the state. These revenues are then invested in infrastructure, education, and to a large share in foreign pension funds. This way, the Dutch disease effects are mitigated because only part of the oil revenues is spent in Norway itself. Furthermore, the benefits from oil extraction are spread evenly among the whole population and even over time. Of course, in order to follow the Norwegian example, one needs a strong, efficient bureaucracy. Otherwise, the oil revenues may again vanish in black holes somewhere in the state bureaucracy. This again strengthens the point to fight corruption.

Governments of natural resource abundant countries, if they want to raise national welfare, should announce credible actions against corruption and take swift action. They should set up proper tax systems and institutions that enforce the payment of taxes. If corruption is credibly fought, the revenues from natural resource exports may be used as in the Norwegian model. Thus, the main priority of these governments should be to find ways to reduce the extent of corruption within their state bureaucracy.

Appendix

The Dataset

The "transition economies" that are being studied in this paper are Albania, Armenia, Azerbaijan, Belarus, Bosnia-Herzegovina, Bulgaria, Croatia, Czech Republic, Estonia, Georgia, Hungary, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Macedonia, Moldova, Poland, Romania, Russia, Slovakia, Slovenia, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan.

However, the most important variable in this paper, ShaPrimEx, is not available for Georgia, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan. Therefore, these five countries are excluded in virtually all the regressions. Another important variable, SCI, is not available for Macedonia, and for this reason Macedonia drops out in some regressions.

Most of the data were taken from the World Bank or United Nations databases. The whole dataset is available upon request from the author.

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