

Siebert, Horst

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Allocation Policy in a Resource - Exporting Country

by

Horst Siebert*

1. The Role of Resource Exports

For a large number of the countries of this world, exports of natural resources account for a sizable percentage of their export value. This ratio surpasses 90 percent for some of the crude oil exporters like Nigeria, Algeria, Iraq and Saudi Arabia. Non-oil exporting countries also reach high ratios of resource exports to total exports, for instance 89,8 percent for Mauritania (iron ore, copper ore), 84,6 percent for Kiribati (phosphates), 78,2 percent for Jamaica (bauxite), and 64,2 percent for Niger (uranium). Table 1 shows the ratio of the value of resource exports to total export value for the resource-exporting countries of the world.

Whereas for some countries resource exports are negligible in relation to gross domestic product [USA 0,4 (1980); Federal Republic of Germany 0,7 (1980)], this ratio reaches a high percentage for the typical resource-exporting country: 90,8 percent for Saudi Arabia, 89,2 percent for Brunei, 57,4 percent for Libya, 39,5 percent for Liberia, 29 percent for Algeria and 25,2 percent for Guyana.

Since exports are so vital as a determinant of national economic performance and as a stimulation of economic development, the role of exports has played a major role in the theory of economic development (Herrick and Kindleberger 1983; Singer

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Table 1 Ratio of the Value of Resource Exports to the Value of
Total Exports of Selected Countries 1)

Country	Year	Percentage	Types of resources
<u>60 - 90 percent</u>			
Angola	(1974)	60,4	Petroleum, iron ore
Liberia	(1978)	62,7	Iron ore, diamonds, rubber crude
Syrian Arab. Rep.	(1978)	63,8	Crude petroleum, phos- phates
Venezuela	(1979)	64,2	Crude petroleum, natural gas, iron ore
Niger	(1976)	64,2	Uranium, thorium ore
Indonesia	(1980)	67,6	Crude petroleum, nickel ores, copper ores, tin ores
Congo	(1978)	68,9	Crude petroleum, lead ores, diamonds
Kuwait	(1978)	76,6	Crude petroleum, natural gas
Jamaica	(1980)	78,2	Bauxite
Kiribati	(1979)	84,6	Phosphates
Mauritania	(1976)	89,8	Iron ore, copper ores
<u>More than 90 percent</u>			
Nigeria	(1978)	90,0	Crude petroleum, tin ores
Iran	(1977)	92,4	Crude petroleum, natural gas
Algeria	(1979)	92,8	Crude petroleum, natural gas
Qatar	(1979)	93,8	Crude petroleum
Libyan Arab Rep.	(1979)	94,6	Crude petroleum, natural gas
Brunei	(1978)	95,9	Crude petroleum
Saudi Arabia	(1980)	96,7	Crude petroleum, natural gas
Iraq	(1978)	98,1	Crude petroleum
United Arab Emir.	(1978)	98,6	Crude petroleum, natural gas

1) Source: Tables No. 2 "Exports by industrial origins (percentage of total value)" and No. 5 "Special exports f.o.b. by commodities according to the S.I.C.T in thousand U.S. Dollars" in: United Nations (Ed.), 1980 Yearbook of International Trade Statistics, Vol. 1, New York 1981

and Ansari 1977), in trade theory (North 1955; Vernon 1966), in the debate on the terms of trade (Bhagwati 1958; Prebisch 1964; Singer 1950), in the discussion on stabilizing natural resource prices (MacBean 1966) and in trade policy issues (Corden 1974; Walter and Areskoug 1981).

2. The Impact of the Resource Sector on the Economy

In the typical resource - exporting country the resource sector affects the national economy through a network of interactions. The following effects can be distinguished.

Employment Effect. The resource sector will employ labor; and it may also provide an incentive to build capital internally. Very often, foreign capital is brought in.

Productivity Effect. In some developing countries the training of labor in the resource sector may be important. Similarly, the productivity of management may increase and technical knowledge may be brought into the country by the resource industry. Thus, the resource sector may be a vehicle of technology transfer.

Withdrawal Effect. Labor and capital have to be withdrawn from other sectors of the economy except when capital is imported from abroad. This withdrawal effect implies a reduction of output in the other sectors (agriculture, industry, service sector):

Linkage Effects. The resource sector may be interlinked with the other sectors of the resource country via backward and forward linkages (Hirschman 1957). The resource sector then can be conceived as a "firme motrice" (Perroux 1961) stimulating intermediary producers (backward linkage) and activities using the resource as an input (forward linkage, policy of vertical integration).

Income Effect. Production in the resource sector creates national income.

Distribution Effect. The income may accrue to private households, to the firms or to the government. It may accrue to the resource country or it may be transferred abroad.

Expenditure Effect. The impact of the expenditure effect will depend on how the income is spent. It may be reinvested in the private sector and it may increase the capital stock of the country. It may be spent in consumption by private households or it may be spent by the government for consumptive or investive purposes. If consumption expenditures affect nationally produced goods, the impact will differ with respect to the sector for whose products the income is spent (tradable versus non-tradable sector; agricultural, industrial or service products). Finally, resource earnings may be used to import consumption or investment goods.

Price Effect. The resource sector also causes a number of price effects. These may be classified into the influence on commodity prices, wages and the exchange rate.

Commodity Price Effects. The resource sector influences the supply and demand conditions for the other sectors of the economy, for instance via the supply side (productivity and withdrawal effect) and the demand side (income and expenditure effect). The price of output in another sector may rise or it may fall.

Wage Rate Effect. The resource sector may be willing to pay a higher wage rate in order to attract qualified workers. Or the trade unions in the resource sector may push for higher wages. The higher wage in the resource sector will dissipate to other sectors of the economy, either through the labor market or through the bargaining of labor unions.

Exchange Rate Effect. The resource sector earns foreign currency. *Ceteris paribus*, this implies a revaluation of the home currency. A revaluation, however, means that the absolute price advantage of the other sectors of the economy (agriculture, industry) is reduced. Consequently, they will tend to export less. The resource sector has a negative impact on the other sectors of the economy via the revaluation of the exchange rate (Corden 1981).

Allocation Effect. The combination of the above mentioned effects results in a sectoral shift in the economy in favor of the resource sector.

3. Intertemporal Allocation

The effects discussed above become relevant in a context of a comparative - static analysis. The resource country is shocked by an increase or a decline of the resource price in the world market. How does the economy of the resource country adjust to this stimulus? And through which channels does the resource sector influence the rest of the economy?

3.1 Intertemporal Optimality

Besides the comparative - static analysis of a shock in the parameters of the resource country, an intertemporal point of view is relevant for the resource - exporting country. For a resource-rich country, a stock of a depletable natural resource represents an asset. Exporting the resource and depleting the stock earns foreign currency and allows imports. But at the same time the resource-rich country loses the option to export the resource in the future. What does the country get in exchange if it runs down its stock of a natural resource? Does the utility enjoyed by earning foreign currency and by importing

today outweigh the utility lost by foregone uses of the resource in future periods? (Siebert 1981a, 1982a,b)

Extracting the resource today is only justified if the opportunity costs of extraction are balanced by the benefits from extracting the resource. For a resource-extracting country, the marginal benefit from extraction is determined by consumption for the present generation or by future consumption made possible from extraction today. The opportunity or user costs are given by the opportunities foregone if the resource is extracted today, i.e., if the resource cannot be used tomorrow. What is the optimal long-run strategy of extraction for a resource-rich country? Should the stock be depleted very "early in the game"? Or should some part of the stock be kept untapped? Which time profile of extraction should be chosen? Which factors influence the optimal use of a natural resource over time? (Siebert 1981a)

The resource - exporting country has to steer extraction over time in such a way that the marginal benefit from extraction equals the marginal user costs of extraction. It is not worthwhile to extract the resource when the user costs of extracting it are greater than the marginal benefit derived from extraction today. Then the asset "resource" should be left in the ground. On the other hand, if the marginal benefits of extracting the resource today are larger than the user costs, the resource should be extracted.

Some important factors operate towards a declining rate of extraction over time. Consider for instance the simple case where the resource is exported in order to import consumption goods. Since the user costs rise with the discount rate and since user costs must be equal to marginal benefits, the marginal benefits must rise over time. Assuming a social welfare function (with the usual properties), this implies a smaller quantity of imports. With a given import price, the import value is reduced over time; consequently, the export value has to

decrease as well. If the demand for the resource export is not inelastic, the resource price will rise and quantity demanded will fall.

3.2 Factors Influencing Intertemporal Supply

The general principle of equating marginal benefits and marginal opportunity costs does not yet give precise answers to the question how a resource-rich country should steer its time profile of extraction. It is necessary to specify marginal present benefits and user costs. Both variables are influenced by a variety of phenomena.

Resource Endowment. A country may have an abundant or a scarce endowment of a natural resource. Abundance for example means that the country may have a large stock relative to the extraction rate so that a given rate of extraction can continue for many decades. It is apparent that a resource-exporting country with resource abundance in an intertemporal sense will supply large quantities today since the actual depletion of the resource stock has negligible user costs.

Capital Scarcity. Resource extraction is capital-intensive. The resource-exporting country may lack the capital to start a natural resource industry. The capital stock may be financed by internal savings; it may also be financed externally by borrowing in the international market or by bringing in foreign firms. In the case of oil, some countries have obtained capital stocks by redefining the property rights for extraction. The way in which the capital stock for extraction is financed has implications for the time profile of extraction.

Technological Gap. As a rule, the resource-exporting country does not have the technological knowledge to explore and extract the resource. It therefore has to bring in the technology from abroad. This can be done by a set of different mea-

asures such as granting extraction leases to international firms or buying their technological services. The transfer of technology is influenced by the institutional setting regulating extraction.

Discount Rate (Time Horizon). A high time preference favors an early extraction. The time preference rate of a resource-exporting country is influenced by such phenomena as individual and social attitudes towards the future, the functioning of the capital market, and the influence of the political system on the discount rate. For instance, the target function of a ruling family (class) in a resource - exporting country may determine the time preference rate of a country.

Elasticity of Import Demand. A resource-exporting country may be very dependent on its imports. This can be due to many factors such as an international demonstration effect in consumption (Nurkse 1953), the unwillingness or the impossibility to reduce import demand, or the necessity to import capital goods for national development. A low elasticity of import demand creates a pressure to earn foreign currency and to export resources. A low elasticity of import demand implies a large supply in present periods and a neglect of user costs.

Population. A large population in a country can be one reason for a low elasticity of import demand; a large population may make it difficult to build up capital internally requiring a high volume of imports for consumption. Resource exports become necessary in order to earn foreign currency.

Elasticity of Resource Demand. The time profile of extraction is also influenced by the demand for the resource. If the demand for the resource is inelastic, the resource-exporting country may have the option to increase its actual benefits by keeping the supply quantities small. If demand is elastic, this option is not available.

Political Response in Resource-Importing Countries. The elasticity of resource demand is affected by the political reaction in the resource-importing countries. If the political system in the industrial nations does not allow the market to react to price changes (compare the U.S. energy policy in the seventies), the price margin for the resource-exporting country may be increased. To let the market operate, implies to increase the long-run elasticity of demand, to stimulate substitution and to reduce resource imports.

Backstop Technology. The resource-exporting country is faced with the risk that the resource-importing countries may find a backstop technology (Nordhaus 1973) that reduces the value of its reserves or even makes them worthless. A backstop technology puts an upper limit on the resource price; it can also be interpreted as increasing the elasticity of demand of the resource-importing countries.

Competitive Position. Demand for a country's resource is also influenced by the country's position as a supplier in the world market. If a country dominates the market or if it can be considered to be a barometric price leader, it has some leeway to realize its own pattern of extraction. If, however, the country has to take into consideration the response of other suppliers, it is restricted in the extraction strategy.

Both, the comparative-static and the intertemporal allocation issue represent interlinked problems and should be studied simultaneously. The results of comparative - static analysis may be affected if the finite stock of natural resources is taken into account.

4. Some Policy Issues

In the real world, the following problems have developed for the resource-exporting countries.

The Dual Economy. Resource abundance of a country may not guarantee economic development. Bringing international mining firms into a developing country may raise the mining sector on a technological level comparable to international standards. But mining may not "carry over" to the rest of the economy, and the resource-rich country may have a "dual economy" (Hirschman 1957; Maull 1980): The export sector is operating on a high technological level, but the rest of the economy remains trapped in the pre-industrial stage. When the concept of the dual economy is applied to the world economy, the world may be conceived as following a polarizing pattern in which the agglomerated industrial nations grow and in which the periphery remains on a low level of development (Myrdal 1956; Predöhl 1962; Prebisch 1964).

The Dutch Disease. In a resource-exporting country, sectoral change and reallocation of factors of production takes place. In a resource boom, the resource sector will expand, attracting factors of production from the other sectors of the economy. Consequently, the other sectors of the economy will contract. This is especially true if the untradeable products of the economy (construction, service sector) are characterized by a high income elasticity of demand and a high labor intensity of production. Then the expansion of the resource-sector implies a contraction of the industrial sector. This problem has been denoted as the Gregory-effect (Gregory 1976) or the "Dutch disease" (Corden and Neary 1982; Hoel 1981; Long 1981). The problem is discussed in Chapter II by Long and in Chapter III by Herberg and Enders.

The de-industrialization²⁾ resulting from a resource boom can be considered as a normal adjustment process. From an intertemporal point of view, preventing the contraction of the industrial sector by policy intervention can only be justified if the de-industrialization is a temporary phenomenon with the industrial sector expanding when the resource boom is over. Then, high adjustment costs can be prevented by protecting the industrial sector. Only this argument of preventing adjustment costs can motivate why the resource boom can be interpreted as a "disease". Of course, one has to take into consideration that in the political process the protection of the industrial sector may evolve as a target in itself. Moreover, the scope of sectoral change is reduced when the inflow of foreign capital is allowed and when the participation rate of the labor force is increased (or when foreign workers are brought in).

Falling Resource Price. A case analogous to the Dutch disease arises when there is a depression in the international market of a resource and when the price of the exportable of a resource-country falls. For instance, the drop of copper prices in 1974/75 had a strong impact on the economy of Chile where copper exports accounted for 77 % of total export value in 1970 and about 50 % from 1975 on. The temporary change in copper prices implies a sectorial readjustment, i.e., a decline of the export sector and an expansion of the non-export sector. Similarly as in the case of the Dutch disease, the problem arises whether policy intervention can smoothen the adjustment process or whether adjustment should be postponed until the price drop in the international market stops. This issue is taken up by Gerken in Chapter V.

White Elephants. To accumulate capital at home, to attract

2) On the problem of de-industrialization compare F. Blackaby (1981).

industry and to locate industrial activities on a higher stage in the hierarchy of production (vertical integration) is a long-run policy option of the resource country. An important prerequisite of such a strategy is not to overestimate the internal rate of return of the investments. White elephants in the desert seem to be an issue for low absorbers, especially the Middle East countries.

Too Low Prices at Home. Quite a few resource-exporting countries have lower internal resource prices than in the world market, for instance Indonesia, Mexico and Venezuela in the case of petroleum products. One argument for this approach is to stimulate industrial development at home. If lower resource prices apply to the industrial sector only, the target of stimulating the home industrial base may be reached. Consider, however, the case in which the lower resource price at home is obtained through an export tax. Then, if households also use the resource extensively, the excess supply of the resource will be reduced in the process of economic development. The resource-rich country will decimate its export potential. This seems to be a problem for Indonesia, Mexico and Venezuela where it is politically very difficult to increase the price of gas in order to reduce home demand and increase export supply.

Too Much Foreign Debt. A country may be overexposed to international debt. High interest rates, falling resource prices and a high political time preference (with national elections in sight) may aggravate the debt situation. The country has to supply a large quantity of resource exports in order to pay its debt service. Its terms of trade will deteriorate. A devaluation of the home currency is required in order to reduce import demand and put aside foreign currency for the repayment of debt. Preventing capital outflow by limiting capital mobility may have a negative feedback on attracting capital in the future and on restructuring the existing debt.

Too High Government Spending. The volatility of resource prices seems to suggest that a resource-exporting country cannot rely with certainty on a constant amount of resource earnings in each period. This is especially true when government revenue largely depends on resource earnings. When government expenditures are relatively fixed, the country may be forced to export more resources with falling prices (inverse supply behaviour). In order to prevent such a situation, it is recommendable to distinguish among a transitory and a permanent component in the government spending of resource earnings.

Optimal Depletion. The resource-exporting country is faced with the problem of choosing an optimal pattern of extraction. Eventually, the stock of a non-renewable resource will be depleted. Depletion occurs too early when the country could have improved its welfare by postponing some extraction. Depletion occurs too late when the country has an untapped stock of a resource in a situation in which substitutes or powerful competitors depress the price of the resource.

Optimal Taxation. When extraction is undertaken by private firms, the optimal pattern of extraction is steered by the institutional setting for extraction (extraction licences) and by taxation. The resource country has to induce private firms to explore its natural resources and thus has to provide incentives for exploration and the attraction of foreign capital. At the same time, the resource country wants some benefits for depleting its natural assets; the country wants to capture part of the resource profits. This issue is taken up by Porter with respect to the Australian experience (Chapter IV). The asymmetry of the bargaining situation (Palmer 1980) between the resource country and the private firm is a crucial condition: Before the resource has been found, the private firm has the exploration risk, and the resource country has to grant favorable tax conditions to the private firms. When the resource has

been found and profits arise, the original risk is forgotten and the bargaining position of the private firm is weakened considerably.

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