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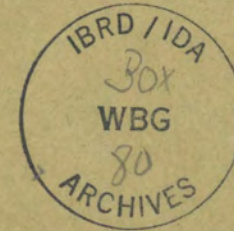


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DICK

PORT PROJECTS IN DEVELOPING COUNTRIES

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1. This paper is in three parts. Part I examines the role of ports in development, Part II the reasons why operation of market forces cannot be expected to automatically give an economically optimal investment pattern and examines the problems associated with demand forecasting. Part III then deals with the translation of demand into benefit streams, the assessment of these streams, and the problems in ensuring they benefit the developing country concerned.

PART I - THE DEVELOPMENT ROLE

2. In attempting to answer the question why ports should be a particularly important agent of growth in developing countries a useful starting point is consideration of the factors governing spatial development. It has been suggested ^{1/} that there at least nine distinct factors which contribute to the distribution of economic growth; (a) The economy's territorial extent (b) Natural resource distribution (c) Historical settlement pattern (d) Transport patterns (e) Total population (f) Levels of development (g) Market location (h) Power location - political and economic (i) Economic organization - state or private sectors dominating. These are, of course, interlinked, but in general, in developing countries there are not the "chicken and egg" problems encountered in developed countries. ^{2/}

3. One does not need to advocate the exploitation theory of historical contact between industrialized and non-industrialized countries to conclude that the primary motivation was usually to obtain commodities that were not available in the former. The new transport medium was essentially shipping, - landward routes have in general been developed much earlier than the shipping routes between continents - and developing countries are overwhelmingly found outside North America, Europe and Australia. Thus port development has tended to be a facet of (a) to exploit (b) super-imposed upon existing market patterns.

4. The role of ports in a country to some extent depend initially upon the availability of sites for them. If resources are close to the coast and there are suitable port sites, there is little point or likelihood of strong development at one site. However where good sites are limited, concentration appears, and most importantly, where inland transport has significant economies of scale, this also results. Such is the case with railways, and their development has been a major concentrative factor. ^{3/} From this initial concentrative feature, often accompanied by direct managerial linkage between port and railway, tend to flow sub-radial patterns as roads are subsequently developed. It is a feature

* NB. The views expressed are those of the author and do not necessarily reflect those of the Bank.

of developing countries that in relation to areas or population rail developments has been much more limited than in North America and Europe ^{4/}. It is also generally the case that reasonable port sites tend to be limited. In West Africa for example, only Dakar and Sierra Leone river in 2,000 miles coastline are considered good natural harbors. ^{5/}

5. Thus there have been strong forces concentrating external activity on a limited number of ports. The reasons why strong economic growth will probably occur at rather than just through ports are twofold. (a) Activity associated with industrial countries is likely to be of hinter-^{high}er technological level than in the traditional sectors (b) With hinterlands largely determined by traditional transport forms the ancient market centres are unlikely to experience significant growth pressure except from population increase while port expansion is a function of trade. Also while a sea boundary is fixed, and therefore presents a definite local interface, this does not apply to a land boundary and indeed because of this it is probably true to say that in most countries with land and sea boundaries, towns on the former have fluctuated in importance to a much greater extent than those on the latter. An indication of the relative importance is that the UN estimated ^{6/} that in 1967 94% of African external trade passed through its seaports. Africa, with its particularly marked colonial history may be exceptional but the same general pattern probably applies even in a non-colonial setting. As external trade has tended to grow more rapidly than GDP in most countries, it follows that the ports have been at least the interface for one of the most rapidly growing sectors of the economy.

6. If this pattern were true of the past, where railway connections were a vital factor in determining which ports prospered ^{7/} what of the future? Despite the rise in petroleum prices, road transport is increasing its share of the total inland transport in most developing countries and the economies of scale, and therefore the centralizing forces of roads are less than in railways. Therefore, might not the pattern become one of improved internal linkages, leading to expansion of hinterlands of inland cities, and dissipation of concentrative forces as applied to the ports? The answer probably depends upon the circumstances of the country. An oil rich state like Iran may well tend to employ its ports increasingly as interfaces for modal transfer of imports of machinery destined for other parts of the country, with the rise of new industrial centres located according to security/social considerations. However, where the state is still relatively poor, (the majority) the road system tends to develop from the main centres, to open up new areas for export materials, and to parallel existing rail systems. Clearly, though the effect on the railways may be disastrous, two out of the three types of development further stimulates trade at the ports. Furthermore, as seaport operation becomes more complex, the constraints imposed by limited availability of managerial talent, commonly cited as a constraint on industrial development in poor countries, begins to affect ports as do concentrative forces in modern sea trade (see later).

7. The movement towards independence from colonialism has probably stimulated these developments. While the political climate is not always stable and private foreign investment is discouraged, the tendency is for many new states to be smaller than would be economically optimal under a colonial regime. This leads to pressure on their governments to attempt to exploit their natural resources as rapidly as possible, and consequently to place demands upon the existing transport system which might not have appeared so rapidly under colonial rule. This is not to judge whether short or long-term resource exploitation is preferable, merely to note the pressure that such a problem generates on the ports.

8. It follows that if the ports are unable to meet the demand growth of the economy may be inhibited severely. This is at least partly because of the critical importance of exports in generating internal capital formation. The export elasticity of demand for imports in developing countries has been estimated $7/$ as 3 times that in developed countries, and while this relationship may have since changed and the food component is probably important, investment goods in the form of raw materials and semi-manufactures not readily available internally are probably also significant $8/$.

9. Thus ports by virtue of their geographical, historical and economic characteristics in developing countries, are almost invariably important focal points of growth.

PART II - MARKET FORCES AND DEMAND FORECASTING

10. As previously noted a large proportion of ports in developing countries originated as means of evacuating raw materials. The vessels plying the trade were of shallow draft; where a moderate channel depth existed, the siting of the port was a function primarily of the desirability of minimizing landward transit. Thus many port sites are located up channels which are (a) of limited depth and (b) are of changing configuration, with uncertain geological characteristics, especially in tropical countries. The more thoroughly investigated subsoil conditions in the country as a whole are nevertheless those at the existing ports. Therefore, there is a strong tendency to place emphasis on expansion of existing ports with, if necessary, substantial and lengthy capital dredging rather than venture into the unknown of uncertainty about geological conditions, and the willingness and ability of the society to make a sharp change in its trading and transportation pattern. The changes would be sharp, because while the size of the economy and its involvement in sea-borne trade may be small $9/$, the minimum size of reasonably economic port developments, largely dependent upon developed country technology, is usually comparatively large. (Of course, even in developing countries, there are many cases where no depth problems exist, but even then, the tendency for the built up area to crowd upon the periphery of the port often makes a movement of port facilities elsewhere a long term necessity).

11. The second, financial, characteristics of significance is that the importance of the port as an economic factor, and in many cases (particularly in the small African countries) the dominance of one port has led to strong pressure for centralized control under some variation of a national ports authority. While this may have an economic logic, especially when the main port user is a large international company, and a countervailing force is desirable, it tends to prevent the port system being one in which the distribution of investment and charging policy is a result of a competitive market mechanism, and to make these decisions a function of government policy. While this may systematically reflect the national interest (through system cost minimization, and/or accurate assessment of the benefits for trade stimulation) it does mean that the financial benefit to a port (or system of ports) will not necessarily accurately reflect the economic benefit to the country from the investment.

12. Thus, long-run economically optimal port development can hardly be expected to flow from the working of market forces in most developing countries, nor are the necessary funds likely to be readily generated internally. Careful study is therefore required of the economic determinants of demand for port facilities, necessitating forecasts for, in general, a minimum of 20 years ahead. This brings into play a third constraint, the fact that in general the skilled manpower required to make such analyses is just not available locally.

Demand Forecasts

(i) Traffic

The problem of demand analysis is generally met by the employment of a team of consultants to undertake the appropriate studies, the finance for, and terms of reference of these studies being commonly provided by aid organizations but with the consultants reporting to the Government or port organization. These are certain potential weaknesses in this system, in particular that it is difficult for the consultants to be completely objective if a government is pressing hard for a project but it does normally ensure an economically logical analysis within certain unavoidable constraints. The basis for recommendations is usually a macro-economic analysis and the first problem is the lack of a consistent basis for measurement of the output of the country, with the resultant problems of forecasting the changes likely to take place. While an intensive large scale study may provide the weights to be attached to sectors of the economy at a point in time, the provision of a historical series upon which forecasts can be based is much more difficult. This is particularly so where, as is often the case, the subsistence sector is large in relation to that in the monetized sector, for the reaction pattern of those in the subsistence sector is difficult to predict.

For example, if an economy traditionally consumes and exports the same type of agricultural produce, the discovery of a new export product (e.g. petroleum) may increase or decrease both agricultural exports, domestic consumption, and even production depending in large part on the reaction of the subsistence sector.

14. Even in the areas where a reasonable basis of historical data exists such as is sometimes the case with export commodities, the dependence upon overseas markets and the common tendency among even experienced forecasters to assume that export targets contained in national plans will be met, (despite the fact that there are almost invariably strong internal political pressures for these to err on the side of optimism) make that element of forecasts which is based upon export traffic particularly hazardous. Unfortunately, in volume terms these are usually very important in developing country port traffic.

15. Thirdly, the existence of threshold levels of consumption of various basic and semi-basic products, below which it is uneconomic to produce locally, also has an important bearing on traffic forecasting. There are naturally strong forces (similar to those affecting plan forecasting) pressing towards import substitution at the earliest possible stage. While this may reduce the volume of certain imports as development proceeds, it follows that it may increase the volume of those imports which are inputs to the substitution process. This source of uncertainty may be exacerbated if the general skill shortage prevents the rate of substitution targets of the Government being attained.

The forecasting picture is not one of unrelieved gloom, however. Just as ports tend to be located to minimize inland transport or to relate to major landward arteries (particularly railways) so this tends to define the hinterlands of ports rather more clearly than is usually the case in developed countries. This situation is only altered to a minor degree by expansion of the road transport network, the tendency being for one inland mode to substitute for another, rather than major transfers to occur between ports.

(ii) Facility Requirement

17. There are two main problems remaining in assessing the berth requirements when the demand forecasts have been made (a) the mode of handling (b) the speed of productivity.

18. (a) Basically, if port operations in total are small, it is probable that traditional general cargo methods of discharge/loading will be employed. If one or several commodities increase in volume to a sufficient extent, first bagged, and then bulk handling methods may be adopted each increasing the potential throughput of a berth (bulk handling quite easily 10 times as fast as general cargo). Containerization can have a similar effect on non-bulk goods.

19. Similarly, if labor productivity can be improved within a given handling method so can berth throughput. The problem is that whereas in some developing countries the potential for productivity improvement is considerable and social conditions favor intensive operations of the capital assets of the port, neither condition may obtain in another country at the same stage of development. Where favorable conditions are present the potential capacity of a port may be comparable to that in a developed country, but several times that in the second country.

20. In addition, the speed and type of modal change, and therefore productivity, in a developing country port is affected by the uni-directional "milk run" characteristics of many conference shipping services whereby the number of ports of call at the developed country end of the trade route is often a fraction of those at the developing end. This again is a function of relative volumes, but it does tend to leave the developing countries particularly at the mercy of technological decisions made by shipping companies. This is most evident in the case of containerization, where the desirability of obtaining high utilization of a capital intensive form of transport tends to lead to a restriction in the number of direct calls. While by virtue of traffic volumes or established commercial links some ports are virtually certain to remain primary, there are others whose potential role is secondary, fed by transshipment, and for which, therefore, expensive investment to accommodate large container vessels in channel and alongside, is economically unjustified.

21. A particularly good example of this is provided by European - West Africa shipping services. At present, there are effectively two general cargo conferences, a British and a Continental European one. Both call at a large number of West African Ports but it seems clear that if containerization develops as foreseen, a number of ports will be serviced primarily by feeder services; it is not yet clear how many primary ports there will be and it is not inconceivable that in ten years time, there will be only two major ports (for political reasons, one in ex-British and one in ex-French territory). This pattern is already developing in the far East and West Indies with Singapore and Kingston (Jamaica) respectively becoming focal points for a wide area.

22. To sum up this section, forecasting in developing countries has its own particular problems, and the degree of uncertainty as to the potential relationship between port demand and capacity is large.

PART III - MEASUREMENT PROBLEMS-BENEFIT STREAMS

23. Having determined the physical effects of a project in terms of demand, the next problem is translation into benefit streams. As previously noted the realizable value of rates and dues will probably not accurately reflect benefits, therefore a suitable surrogate is required. This is

unlikely to be the same for all situations. Some common direct measures and their applications are discussed below.

Ship Waiting Time

24. This measure, the number of days ships are awaiting berths, is commonly recorded at ports. It is also possible to estimate the degree of berth utilization associated with a given ratio of ship berth days to ship waiting days. Further, from the same analysis it is possible to estimate the effect of increasing utilization (through increased demand, all other factors being constant) on ship waiting time 10/. Given the known or estimates costs of delay to vessels, the cost to shipping companies of such increased utilization can be calculated, and used as a measure of the benefit to be gained from a project. The problem with this type of analysis is that it is only appropriate when utilization is at a reasonable level at the time of project consideration otherwise a small increase in traffic is liable to lead to infinite ship waiting time and thus benefit from avoidance. A distinction must be drawn between the costs associated with delays to scheduled liner services, and the (normally smaller) costs of the same delays to unscheduled tramp shipping 11/.

Alternative Ship-Handling Methods

25. In these circumstances, without project solutions outside the constraints imposed by port capacity require examination. One of those is discharge outside the berthing area, the simplest form, assuming suitable conditions of shelter, being lighterage. This solution has two aspects. (a) It will increase the average vessel discharge time compared with berth operations, (b) labor productivity on the incremental traffic is likely to be below average. The first aspect introduces the need for measurement; the second, however, raises the question of how to measure. If there is a large mass of urban employed in the port area, the shadow price of labor may be zero. This latter aspect is important in consideration of any schemes which will result in a substitution of capital for labor.

Diversion

26. A further possibility, where other ports or land boundaries exist, is that when capacity limits are reached traffic will be diverted elsewhere. It is then necessary to know the final destination of the traffic. With the historical tendency towards enclaves, this may in fact present less problems in developing than developed countries, and with less network possibilities, resulting from limited lines of communication, the cost analysis may also be easier. However, the costs/benefits of diversion as an alternative should also take into consideration the longer term effects of restriction on port traffic volumes on the type of development of the port, in particular with respect to containerization, noted in Part II. Also, transfer across national frontiers can present political problems.

27. It is, of course, possible to utilize a combination of measurements. For example, diversion costs may be appropriate for the project of several berths as a whole, while ship waiting time measures the benefit from the marginal berth. More radically, it may in certain circumstances (e.g. where the only available harbor on an island is silting up) to assume that some investment is required to maintain essential trade, and switch emphasis to minimizing investment cost to provide a given level of service.

Port Simulation

28. The measurement of the above types of benefits depends upon a complexity of factors which have been briefly touched upon in previous paragraphs - type of discharging, volumes of traffic and of associated shipping movements, and size of vessels etc. In effect, a simulation of the operation of a port, or parts of a port is necessary under different sets of assumptions, ranging from a maintenance of present conditions to the most sophisticated set of port operating assumptions. The extent to which this can be assisted by a computer model depends largely upon (a) the equal probability range of values that can be attributed to each parameter, and the number of parameters, resulting in final analyses of greater or lesser range, (b) the extent to which there are definite gaps in knowledge which have to be filled arbitrarily. In rapidly changing circumstances the latter may be very important. An example of the possible complexity of the former, as employed in an actual case is given at Appendix A.

Indirect Benefits

29. The above measures, are, however, only the direct ones, and it is arguable that in developing countries other factors should be taken into account. These relate particularly to the employment generating and skill creating characteristics of port development. The employment generating function has two aspects: (a) during construction, when the skill level of the local employees may be so low for the shadow price of labor, in countries which normally have a large number of urban unemployed, to be ^{at most} zero, (b) the longer term operational characteristics of the port. This latter has two features: (i) because of the operational characteristics of machinery and the fundamental need for minimizing, for any type of cargo, the time a vessel spends in port, the production possibility curve relating labor and capital inputs may be very short i.e. very limited opportunities for substituting one for the other; (ii) however, it may be that because of the low financial cost of labor, a labor intensive technique (such as manual shore handling) may resist pressures for a more capital intensive one (e.g. containerisation) for longer than in developed countries, and thus maintain employment.

30. The skill creating aspect almost invariably works in the opposite direction, in relation to the port in the short term. Containerization increases mechanical skills but potentially severely reduces employment in the port. However, maintenance requirements in fact stimulate employment outside the port area, and the net reduction in employment may not be excessive 12/. Also, as noted above in some developing countries the inherent mechanical skills are quite high, and therefore the long term rate of increase of labor productivity that could be expected from an injection of capital is greater than in a more developed society. In either the employment generating or skill creating case, the effect is to indicate a shadow price, for labor or capital respectively, lower than would otherwise be the case.

31. In addition, a factor which is of increasing importance in developing country analysis is the effect of projects upon income distribution, with the objective of greater egalitarianism. As noted above, the tendency has been for economic activity to centre on a small number of ports; thus in geographical terms, introduction of an income distribution criterion in port projects would tend to work in the opposite direction from the more market oriented determinants. In view of the scale effect on the type of demand for port facilities, this cannot be overcome, by the simple rationale of "2 ports of X capacity equals 1 port of 2 X", and it has to be accepted that the "efficiency" of investment may be altered significantly.

32. In view of the lack of directional uniformity between direct and indirect benefit streams, are the latter worth considering in project assessment? Again, a general assessment seems inappropriate; in some instances indirect factors may have been subject to close study in other contexts (e.g. rural development) and thus feeding in the indirect factors may not be difficult. However, as noted later, if risk minimization is given more weight in project assessment than in developed countries, it follows that in general the increase in uncertainty associated with inclusion of indirect benefits is undesirable, and this is only partially offset by the favorable distribution of such benefits between the user (the shipping companies) and provider of facilities.

Benefit Measurement

33. The factors described so far have an important bearing on the analytical approach to be adopted. Thus there is some basis for believing that the arguments employed in a developed country in choosing between conventional methods of measurement are not necessarily appropriate in this context. The comparison between net present value, discounted cash flow, and payback period analysis provides an example.

34. The strongest advocates of the d.c.f. approach point to three main advantages. (i) Yield is a better measure of risk than n.p.v.; (ii) businessmen tend to understand yield better; (iii) the necessity of deciding what is the cost of capital is obviated 12/. Against this it is admitted that the n.p.v. method can give opposite ranking for projects with the same capital outlays but with different earning streams, from those given by the yield method, because of the different interest rates involved. It is suggested, however, that usually the decision required is accept or reject, and that the capital rationing situation where ranking may be relevant is normally unimportant.

35. While the above rationale may be appropriate for commercial projects it is less so for ports in developing countries. The cost of capital may be critical. If the foreign exchange component is high and foreign exchange supplies limited or erratic through dependence on exports with fluctuating prices and values, the shadow price of foreign exchange may be very high. Conversely, if domestic capital generation is substantial the domestic rate may be much lower and consequently if the production possibility curve allows any substitution between domestic and foreign inputs, an n.p.v. calculation based on the range of alternative capital "mixes" would tend to encourage the least cost combination. A d.c.f. calculation would not directly produce a comparable result.

36. Secondly, the timing of port (and other major) projects is critical in changing technological circumstances. While d.c.f. and n.p.v. methods will both indicate that optimum timing will give better results than pre-optimum, with both post-optimum will give even better until capacity is fully utilized. However, a project may have justification at an earlier date and this may be measured by the first year rate of return - if this is sufficient to cover the cost of capital, it may be argued that the project should be commenced (this needs to be carefully judged to ensure that the first year when it is physically possible for the project to be fully utilized is employed). As the n.p.v. of that year's benefit stream is employed for this test, it seems logical to use the same approach for the overall analysis.

37. The choice of n.p.v. has one potentially important defect; it relates return to capital cost rather than project risk. As noted, the latter is potentially serious. One method of overcoming this may be to introduce a pay-back period cut-off constraint. This would largely overcome the problem of purely time associated risk, such as might be the case where a contract with a raw material exporter had a set period to run, with renewal uncertain. However, it is less suitable for the situation of potentially gross under or over estimation of demand for the facility. Clearly on the basis of a mean demand forecast, the results of analysis will be the same with a narrow and wide range of alternatives, whether n.p.v. or yield methods are employed.

38. Equally clearly, where there are a limited number of projects and, therefore, use of probability analysis can hardly give assurance of a balance between success and failure being achieved, there is a strong case for minimizing risk. The reason for this is that there tends to be a skewed distribution of benefit around the mean. If demand is underestimated, it is usually possible by draconian measures to temporarily raise productivity (by e.g. increasing the labor/capital ratio). However, if demands does not materialize, the investment represents sunk capital, with little opportunity cost value (an excellent example of this is the grossly underutilized Tema harbor in Ghana, representing a serious and irrevocable misallocation of resources). This is partly a function of the extreme "lumpiness" of port investment. There are usually minima investments, particularly in terms of quay length, and the useful increments tend to be in terms of "berth" lengths, however defined. The same applies to a lesser extent with breadth, and depth alongside.

39. This may be covered by giving different weights to the extreme possibilities, from that applied to the mean, to get an weighted aggregate; negative values could be given proportionately higher (instead of lower, for positive) weights. The example below illustrates the possible technique, as applied to n.p.v. results, the low risk case giving the highest weighted n.p.v.

	N.P.V. L	Case I (Low Risk) Weight	Total n.p.v.	Case II (Low Risk) Weight	Total n.p.v.
Max.	750	.1	75	550	55
Mean	500	.5	250	500	250
Min.	250	.4	100	450	180
	Av. 500	1.0	425	Av. 500	485

Benefit Distribution

40. The ease with which a country can gain the benefit for a port development depends to some extent on the type of overall benefit. At one extreme is the case of a development preventing excessive ship delay and this in turn enabling a proposed surcharge to be avoided. If imports are fob plus shipping, and exports cif, the total benefit accrues to the country (if the probably minuscule effects upon demand of the slight differences in prices between the with and without surcharge are ignored). If the reverse situation applies, the benefit is zero. Probably the effect

lies somewhere between these extremes, depending particularly upon the degree of perfection of the export market. Despite this uncertainty, this is about the only case where a reasonable element of the benefit can be assumed to accrue automatically to the country.

41. Where expansion in traffic is the determinant of the project size, an additional factor is introduced. It may be difficult to convince shipowners (or even the port management) that charges should be raised to extract benefit especially if the port authority is receiving monopoly profits. However, almost certainly the scheme will reduce the costs of discharging and handling existing traffic (as well as incremental). This can be to the benefit of foreign agents or shipping companies, (a) through reduced delay, below the threshold level at which surcharges would operate, (b) through reduced damage and pilfering during discharge and on the quayside. The former is psychologically difficult to recover; the latter, which may in the long term result in lower insurance costs, will only benefit the country if passed on, which may be difficult to ensure.

42. The third situation, where a project is purely cost reducing, such as with a channel dredging project may benefit the country only in the most indirect fashion if at all. Usually this applies to raw material exports, and only if the international market is a perfect one, and a failure to provide a deeper channel would reduce or eliminate exports can the country be sure it is obtaining substantial benefit. In practice because the exploiting companies are often the user of the raw material (as e.g. with many ore extractors) the market is imperfect, and the benefits from larger vessels go directly to the companies, while the costs are shared, the company buying the vessels but the country paying for the dredging. In such circumstances, the port should impose higher charges; in practice this is often not done, and there is no other way in which the country benefits.

43. Thus the direct benefits of port development may be difficult to secure for the country, unless with the tacit consent of the shipping conferences or lines. This may be forthcoming where a conference considers a port of prime importance to its activities. Conversely, although the conferences may encourage all ports to invest heavily in modern facilities, they are unlikely to be willing to accept steep increases in charges by those which have misjudged their traffic potential - to some extent, there is an element of "heads I win, tails you lose" in the attitude of conferences to investment in the less important ports.

44. As there are difficulties in extracting direct benefits from shipping companies, should pressure be placed on land locked countries using the port facilities? The problems are three: (a) in many cases (examples will be given) a land locked country has some choice in means of exit to the sea - especially in view of the disaggregation of colonial

areas into separate states - and it is often very difficult to assess the differences in marginal cost between different routes, and thus the scope for benefit extraction, (b) the interior areas of the coastal state often have close trading links with the land locked country, and thus indirect benefits obtain from the port linkage, (c) perhaps most importantly, while political boundaries are often of recent origin, the tribal, ethnic and trading linkages are usually of longer standing and thus in effect a region may be more closely integrated than first appears from the political boundaries. It also follows that if such linkage is undermined by attempts to superimpose new "nationalistic" considerations, the economies of both countries, if in some sense sub-optimal in size, may be damaged. The extent to which this is true relates once more to the national port hinterland questions, raised in Part I.

45. Fortunately, the indirect benefits are probably largely retained within the country, and in fact may generate extremities which are also beneficial. Skill creation initially generated by the port related activities will probably percolate into other sectors through normal turnover processes, and may thus enable the production possibility curve for the local industrial society to be extended with consequent improvements in the long term potential productivity of the indigenous labor force. Similarly, the employment generating effects are likely to have a more immediately beneficial impact if one which has less important long-term implications.

Conclusions

- (a) Historical, locational and development factors have made ports important centers of economic growth.
- (b) The market mechanism cannot usually be relied upon to indicate the optimal pattern of development.
- (c) Demand forecasting presents particular problems related to lack of time series, and changing social and political patterns, and to uncertainty regarding potential productivity and the pace of change of shipping modal patterns.
- (d) Direct benefit measurement is difficult, and despite the existence of potential indirect benefits, there are serious possibilities of ending up with "white elephants".
- (e) In view of this, and the skewness of benefit and cost distribution from under/over investment emphasis is desirable on risk minimization. This influences the desirability of alternative measurement techniques.
- (f) Extraction of direct benefits for the developing country presents problems and pressure (where possible) on land locked user countries not necessarily desirable. Indirect benefits, however usually accrue to the country, and can be significant in the longer term.

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4.

	Rail miles per sq miles	Persons per rail mile
UK	0.210	2,700
USA	0.063	900
Nigeria	0.004	45,000
Iran	0.003	16,300
Thailand	0.008	20,000
Cameroon	0.002	12,500

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