SELECTED ISSUES AFFECTING THE ECONOMIC POTENTIAL OF SMALL DEVELOPING COUNTRIES

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This paper deals with some of the problems of creating an economically viable research and development base in small developing countries. The unique characteristics and special problems experienced by these small states may warrant special treatment.

The nature of this problem has not been adequately addressed and no definite conclusions can be drawn at this stage. However, there is sufficient evidence to suggest that further investigation is required of development potential and especially of the role of R&D in promoting development in these small states.

A number of articles have appeared recently which herald the decline of "rigid" single model or single strategy development doctrine (Killick, Lewis). The earlier consensus on development strategies that existed at various points in the last 30 years has broken down. It is argued that any new consensus needs to take account not only of the interconnectedness of development, but accept the need for a much more differentiated development process for different countries. A recognition of greater diversity and perhaps strategic differentiation of development options according to country groups, for example, would need to be included in future development doctrines.

The import substitution and industrialization focus of the 1950s, the basic needs and growth with equity thrusts of the 60s and 70s, and the market forces and macro-balance approach of the early 1980s will all retain some attraction and utility but never complete dominance. The greater choice of development strategies will avoid forcing countries into the same strait jacket.

However, this will make development strategies for individual countries that much more problematic as the interaction of the diverse factors affecting development potential will seldom, if ever, be uniform across countries. The locational prospects of a strategically placed Singapore relative to a landlocked Nepal or the effect of differing natural resource endowments of Mali or Chad as compared to the Ivory Coast will certainly shape the particular type of development options of these various countries.

The identification of Third World country groups has been a subject of ongoing interest. One such country group is that of the Least Developed Countries characterized by particularly acute poverty and chronic economic development problems. The OPEC states have been recognized as a unique group for over a decade and more recently, the category of newly industrialized countries (NICs) has entered the development lexicon. Another country group with special development problems is that of the small developing countries. Various international conferences since the late 1950s have attempted to identify and define the relationship between country size and economic development as well as determining the principal and unique characteristics of small Third World states. They have been the subject of several academic studies and more recently the attention of a special Commonwealth Secretariat review.[1] Small developing countries, as a country group, however, seem to remain on the periphery of the international development agenda.

It is assumed that small countries will have limitations in terms of potential economic size of such severe dimensions that their development options and, in particular, the type and level of R&D that can be economically justified will be significantly different from larger countries. This paper explores some aspects of this issue.

Population is used by consensus as the principal criteria for demarcating a small country. Various studies have shown a general congruence between population size and other measures of size though not necessarily a causal relationship or statistical correlation. The cut-off population size varies between 5 and 10 million, but for our purposes, the latter has been selected. However, any definition of small countries is purely arbitrary and depends on the issue or problem being investigated.

What sort of numbers are we talking about? From the table below, we can see that approximately 75% of all the countries in the Third World have a population of less than 10 million, and 51% have less than 5

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1 Commonwealth Secretariat, 1985, Vulnerability: Small States in the Global Society, Report of a Consultative Group.

million. The GNP of all but 7 of the 85 countries below is under US $10 billion - fifty-six of these countries have a GNP below the US $5 billion mark.

Table 1: Country Size and Gross National Product (1983)

Population (Million)	GNP (US $ Billion)					
	$ 1	$1-5	$5-10	$10	No data	**Total**
0 - 1	17	7	1	-	8	**33**
1 - 5	5	14	2	4	3	**28**
5 - 10	-	13	6	3	2	**24**
Sub Total (below 10M)	22	34	9	7	13	**85**
10 - 20	-	3	2	5	1	**11**
20	-	2	3	17	1	**23**
TOTAL	22	**39**	**14**	**29**	**15**	**119**

Source: World Bank Atlas 1986

GNP figures are used to indicate the level of economic activity and the potential resources available for economic development, although it is obvious that as an indicator of potential it is very inadequate. Data is very sketchy on the available natural resources which is why geographical size is often used as a surrogate.

One consistent finding in other studies is that there is no relation between country size and GNP per capita. Smaller countries do not necessarily have lower per capita incomes. There is, however, a difference when one examines fluctuation around the trend rate of GNP/capita growth. Table 2 shows that small countries, especially those between 1-10 million population, exhibit wider growth rate fluctuations and tend to experience recession more severely. Preliminary data for a short time period

corroborates this, though it would be prudent to undertake more extensive research over a longer time period.

Table 2: Real GNP/Cap Growth Rates (1972-1982)

Country Size (Million)	Growth (+0%) Number	(%)	Decline (-0%) Number	(%)	No Data	Total
0 - 1	16	(59)	11	(41)	6	27
1 - 5	16	(57)	12	(43)	-	28
5 - 10	16	(72)	6	(28)	2	22
Small Countries (below 10 Mill)	48	(62)	29	(38)	8	**85**
10 - 20	6	(60)	4	(40)	1	10
20	19	(86)	3	(14)	1	22

Source: OECD, Development Cooperation, 1984 Review, Table II.I.13, pp. 265-267.

Data for 1972-1982 indicate that 62% of small countries had a positive real GNP/capita growth rate compared to 60% for countries of 10-20 million and 86% for countries exceeding 20 million poeple. On the other hand, data for 1980 to 1983 show that only 45% of small countries had positive growth rates compared to 62% for large countries. Data for 1983-1984 reveal some interesting patterns. For countries under 1 million population, 79% had positive growth rates, compared to 30% for countries between 1 and 10 million and 72% for those with over 20 million. Further, the 1-10 million group experienced abnormal declines -- 35% had negative growth rate of over -3%. This was more than double the amount for any other country category.

This information is certainly not conclusive in terms of growth rate and size. In fact, the micro states of less than 1 million did better than those of the 1-10 million but it does suggest some worrying possibilities and clearly deserves more study.

Production in small developing countries has been found to be highly concentrated in terms of the commodities produced. Reliance upon one or two principal commodities is very common and reflected in the composition of exported goods.

Table 3 shows that imports and exports account for a greater percentage of GNP in the smaller states, indicating their greater degree of dependence on international markets.

Table 3: Small Countries and Economic Development Distribution of Imports and Exports as a % of GNP by Country Size (Median, 1983)

	1 - 10	1 - 5	5 - 10	10 - 20	20
Exports	23%	26%	22%	19%	10%
Imports	30%	33%	24%	18%	17%

Source: Calculated from data in the World Development Report, 1985

Small and large developing countries exhibit similar patterns and both tend to be vulnerable to sudden short-term fluctuations in export prices. However, they differ fundamentally in two important respects when faced with long-term changes in the international division of labour. First, as a result of a smaller resource base, the potential to shift productive activity to new commodities in an effort to adapt to long-term changes in the terms of trade is arguably less in the small developing country. Second, the security net would appear to be smaller in the event of a failed adaptation. Small countries generally have less resources to fall back on than do their larger counterparts.

These are not necessarily absolute or fixed constraints which limit the level of development attainable by small developing countries. They are constraints which limit the range of options open to a small country and will undoubtedly affect the development strategy in a way which larger

countries are not constrained. Further research, both theoretical and empirical, is required in order to more concisely frame these issues; but that they need to be addressed is quite clear.

One area which is increasingly under investigation is the role of science and technology in the contemporary development process. Historically, S&T has proved to be of considerable significance in the economic development of industrialized countries. Central to this process has been the establishment of an indigenous R&D capacity which is capable of creating and adapting new knowledge for use in the productive sector. Attention is now directed to an examination of this in relation to the development options of small Third World states.

The research and development activities of small developing countries are thought to be inadequate for the development needs of those nations. This belief appears to be based on two observations. First, the level of R&D activity in the Third World is low in comparison to the industrialized countries, and that R&D which is done is concentrated in the larger developing countries -- India, Brazil, Mexico. Second, there is some support for the idea that a certain minimum critical mass (MCM) in terms of human and financial resources is needed before R&D can be productive. This critical mass may be beyond the resources that are available in many small Third World countries.

Global research and development expenditure for 1984 is estimated at US $240 billion with the Third World accounting for 6% of the total or US $14 billion.[2] (See Table 4) This compares with the LDC share of world GNP

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2 Calculated from data provided in the OECD observer No. 139, 1986 and the 1985 UNESCO Statistical Yearbook. The ratios for 1980 from UNESCO were used and then extrapolated to 1984 using the R&D budget data for the OECD countries ($190 billion). The results are in Table 1.

Table 4: R&D Expenditure Data as a % Share of World (US $)

R & D Expenditure		% Share of World		
		R&D	GNP	Popul.
Global 1980	- $207.8 billion			
Developed	- $195.4	94	79	19
Developing	- $ 12.4	6	21	81
Global 1984	- $240 billion			
Developed	- $226	94	79	21.5
	- OECD $190	79		14
	- USSR $ 36	15		7.5
Developing	- $ 14	6	21	78.5
		% Share of OECD		
		R&D	GNP	Popul.
OECD 1984	- $190 billion			
USA	- $ 98	52	44	29
Top 5	- $167	88	78	66
Bottom 5	- $ .97	.5	1.5	3.6
Countries less than 5 million population (6)	- $ 2.42	1.2	2.4	2.6
10 million popul. (10)	- $ 6.8	3.6	5.8	7.9

Sources: OECD Observer No. 139, 1986, statistical insert
UNESCO Statistical Yearbook, 1985

at 21% with 79% of world population. Within the developing countries, there are marked regional and country disparities. Using data for 1980, there is a clear concentration of R&D effort in Asia with 56% of total LDC R&D expenditure followed by Latin America with 30%. Within regions, there is an even sharper contrast between countries. In Africa, Nigeria accounts for 50% of the sub-continents research effort.[3] In Asia, the Peoples Republic of China is responsible for an estimated 40% of the regional total. Similarly, Brazil alone was responsible for 50% of the R&D effort in Latin America while Argentina and Mexico raise the level of concentration to 77% of the regional total (See Table 5). What this means is that approximately $8-9 billion of LDC research and development expenditure was accounted for by 8 countries. Of course, there is a similar situation in the OECD countries with the largest 5 countries accounting for 88% of OECD R&D expenditure. This still leaves a substantial real level of resources for research of $28 billion for the remaining countries.

The situation of the small developing countries is difficult to ascertain owing to the absence of reliable country data. Notwithstanding the relative smallness of the R&D effort being undertaken by these developing countries it is important to more accurately enumerate the level of resource allocation and its application. The focus of much recent effort by the Office of Planning and Evaluation of the IDRC has been on determining the existing resource allocation to research and development in selected small Third World countries. The importance of defining an accurate inventory of resources allocated to R&D is self-evident; without one it would be impossible to know where the bottlenecks exist or where an infrastructure on which to build exists.

To better understand the situation of the small Third World countries, an awareness of the science and technology environment and issues facing these countries is required in order to assess the significance of the existing research and development effort.

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3 This excludes the Republic of South Africa.

Table 5: R&D Expenditure Data as a % Share of LDC (US $)

R & D Expenditure	% Share of LDC		
	R&D	GNP	Popul.
Third World (1980) - $12.4 billion			
Sub-Sah. Africa- $ .698	6	8	11
Arab States - $ 1.03	8	24	7
Latin America - $ 3.7	30	31	11
Asia - $ 6.9	56	37	71
Source: (UNESCO) 1985 Yearbook			
Latin America (circa 1980) - $ 2.3 billion			
Brazil - $1.2	50	34	34
Argentina, Brazil, Mexico - $1.8	77	69	61
Source: IDRC			
Africa (1980) - $ .698 billion			
Nigeria - $ .344	49	45	23
Source: (UNESCO)			
Asia (1980) - $6.9 billion ($2.5 billion)[1]			
India - $ .971	14 (38)	19 (29)	30 (51)
Korea - $ .368	5 (15)	7 (11)	2 (3)
Indonesia - $ .277	4 (11)	8 (12)	6 (11)
[1] 1982 study, in brackets excludes China Source: UNESCO (CASTASIA/UNESCO)			

The science and technology issues faced by small developing countries are extremely complex; not only are they attempting to meet domestic economic needs, they are attempting to do so in an international environment which is undergoing rapid technological changes. It was once thought in industrial development theory that the basic industrial activity that requires low capital and high labour input would eventually shift to those countries which have a comparative advantage in those factors of production. Concomitantly, industrialized countries would shift into high technology, high capital intensive productive activities (Vernon, Hymer). What was not anticipated was the recent phenomenon that Walsh observed: that basic industrial activities are becoming more technologically intensive. Consequently, the industries "traditionally" relegated to peripheral regions as development proceeds are now experiencing a "renaissance" and are the object of considerable R&D effort in the most industrialized countries of the world (Walsh).

What this means is that, as the large countries invest more at this level of productive activity, it will raise the technological content of commodities and thus increase the threshold level of S&T activity in terms of the necessary supporting S&T infrastructure. That is, a higher level of S&T capability will be required just to enter basic industrial production let alone ongoing S&T development.

It has traditionally been in the less capital intensive industries that developing countries have been able to break into the international markets. If these industries are becoming more technologically complex there is a possibility that they are being further removed from the options available to all but the newly industrialized countries (NICs) or those in which there is significant involvement of multi-national corporations. Nigel Thift has noted that NICs receive from 50% to 60% of all direct foreign investment going to the Third World (Thift, 1986, p. 27). It is not unreasonable to assume therefore, that the small developing countries receive a very small portion of the remainder. The implications of these changes are manifold but most important is that the threshold level of capital to invest in S&T research and development is probably increasing

for manufactured commodities thus limiting the range of feasible goods for small LDC production. However, the implications of this changing international division of labour have yet to be fully examined with regard to small Third World countries and their S&T research and development systems.

Further investigation of the applicability of the concept of a minimum critical mass may also help shed light on the options small countries have in deciding on a development strategy. Some initial steps have been made to calculate a minimum research module for research in agriculture but these should be treated with caution. Agricultural research is the most important research sector in nearly all the countries under consideration with the odd exception like Jordan or Singapore. In many cases, it is close to half of all research carried out in developing countries.

The idea of a minimum critical mass is that you need a certain number of disciplines working together in a team to have any realistic chance of developing new technology which is useful to producers. Estimates have been made for agricultural research which indicate that approximately 4 chief researchers at the M.Sc. or Ph.D. levels and 8 with a B.Sc. are needed for one commodity program. In many middle income LDCs, this would require annual operating costs of up to $.5 million.

Using existing average LDC expenditure levels on research of approximately 0.5% of agricultural GNP on research, then one would need crop production of $100 million annually just to reach that minimum $500,000 expenditure. This would mean that research expenditures would be insufficient for all but the most important commodities in any of the smaller countries. Even doubling the percentage spent on research would still leave a large number of crops without sufficient research activity to reach a minimum critical mass.

If one constructs a minimum research package based on this minimum research model for say five key commodities and assumes an equal amount of resources required for other kinds of agricultural research and a 50% share of agriculture in national research, we could be talking about a minimum annual research expenditure of $10-15 million, a figure dramatically above existing levels in many countries.

A similar claim has been made based on a minimum land area -- that research is justified only on commodities cultivated on at least 100,000 hectares. This would automatically exclude 48 LDCs where total arable land for all commodities is less than 100,000 ha.

There are a large number of heroic assumptions here and a lot more work needs to be done in this area. However, this limited evidence does suggest that the potential for small countries to generate their own technology is limited. Consequently, they will have to look to external research.

Fortunately, there are significant opportunities to benefit from external research. A multilateral research system of almost 200 research or research supporting institutions located in the Third World has been created over the past 30 years. (Searching, 1985, p. 11) Networks which pool the resources in different countries to work on a particular problem can have a big effect, and many of these multilateral institutions are involved in regionally significant research efforts. Attempts have been made to determine how small countries have benefited from external research, notably a recent CGIAR study.[4] However, the evidence here is also limited and further work on determining how small countries can maximize the benefits from external research are required.

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4 CGIAR "Achievements and Potential of the International Agricultural Research Centres", Jock R. Anderson, Draft August 1985.

Location of Multilateral-Research Institutions in the Third World

(number per country)

Africa		Asia		Latin America		North Africa & Middle East	
Kenya	15	India	6	Brazil	5	S. Arabia	4
Ethiopia	6	Thailand	11	Peru	6	Syria	3
Nigeria	5	Malaysia	9	T. & Tobago	6	Tunisia	2
Senegal	7	Pakistan	1	Jamaica	1	Iraq	6
Togo	1	Singapore	4	Costa Rica	6	Sudan	1
Zaire	2	Taiwan	1	Mexico	6	Jordan	3
CAR	1	Philippines	9	Argentina	5	Kuwait	2
B. Faso	8	Bangladesh	2	Venezuela	4	Egypt	4
Mauritius	1	Nepal	1	Uruguay	3	Moracco	1
Tanzania	5	Sri Lanka	1	Colombia	4	Lebanon	2
Niger	1	Indonesia	3	Ecuador	2		
Cameroon	6	Papua New Guinea	1	Chile	10		
Mali	2			Guatemala	4		
Ivory Coast	1			Dominican Republic	2		
Burundi	1			El Salvador	1		
Zambia	2			Barbados	1		
Botswana	1						
Ghana	1						
Liberia	1						
Regional Total	67		49		66		28
% of Total	32%		23%		32%		13%

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