

Caricom Countries and the Irrelevance of Economic Smallness

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ABSTRACT *The pioneers of development argued that natural resources determined a country's economic structure of production. Since a small country would of necessity have a smaller endowment of natural resources than a large country, they further argued that the economic structure of production of a small country would be more concentrated than that of a large country. This article contends that economic smallness is no longer an important determinant of a country's economic structure of production. The global economy is becoming more and more integrated and knowledge skills have become the most important resource in production processes. If, therefore, small countries such as those in Caricom can accumulate in sufficient quantities the appropriate knowledge skills, they can have a diversified economic structure of production by developing new products and services, and by attracting foreign direct investment.*

Shortly after World War II many economists in the more developed countries began to direct their research to the causes of underdevelopment in less developed countries. They believed that underdevelopment in the less developed countries could be ameliorated by, in addition to other things, diversifying the production structure in those countries. Ragnar Nurkse, for example, argued that less developed countries could not rely on a growing external demand for their primary commodities to promote long-run development. He recommended a programme of balanced growth, which required investments in a number of different manufacturing industries whose growth is sustained by the demand for one another's products.¹

Analysts have pointed out some of the limitations of the balanced-growth strategy,² but an important limitation, as it applied to less developed countries, was that their economic smallness set a very low limit on how far they could diversify their economic structure of production.³ Kuznets said that 'the economic structure of a small nation will be less diversified than that of a larger unit—production will be more concentrated in a few industrial sectors'.⁴ One reason for the narrow economic structure of production in less developed countries was that the smallness of domestic markets militates

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against an optimum scale of plant for most modern industries,⁵ unless, of course, small countries have easy access to rich external markets. But, as Nurkse argued, the markets of the rich countries were not easily accessible to commodities from less developed countries and Kuznets considered foreign markets an unsound basis for developing domestic industries.⁶ Thus their small domestic markets remained an important constraint on their economic structure of production.

A further constraint on the ability of small economies to have a diversified economic structure of production was a lack of a 'diversity of underground resources, land surface, water bodies, coastline and climate',⁷ which was caused by their geographical smallness—a very large country will most probably have a diversity of natural resources and climate. As Arthur Lewis said: 'The extent of a country's resources is quite obviously a limit on the amount and type of development which it can undergo'.⁸ The lack of a diversified natural-resource base, in the opinion of the early development economists, played a significant role in determining the economic structure of production of small countries; and since most of the less developed countries were small, a lack of a diversified natural-resource base limited their production structure.

On the issue of natural resources and economic prosperity in less developed countries, some economists of late have taken a position opposite to that of the early development economists. They argue that an abundance of natural resources does not promote, but hinders, economic growth.⁹ In a recent study Jeffrey Sachs and Andrew Warner said that 'the finding in repeated regressions using growth data from the postwar period is that high resource intensity tends to correlate with slow growth';¹⁰ further, 'almost without exception, the resource-abundant countries have stagnated in economic growth since the early 1970s, inspiring the term, "curse of natural resources"'.¹¹

Resource-abundant countries perform poorly economically because of corruption. Transparency International publishes every year a Corruption Perceptions Index (CPI) 'reflecting the perceptions of business people and country analysts, both resident and non-resident'.¹² The index ranges between 10 (highly clean) and 0 (highly corrupt). The Corruption Perceptions Index for 2004 shows that 'oil-rich Angola, Azerbaijan, Chad, Ecuador, Indonesia, Iran, Kazakhstan, Libya, Nigeria, Russia, Sudan, Venezuela and Yemen all have extremely low scores. In these countries public contracting in the oil sector is plagued by revenues vanishing into the pockets of western oil executives, middlemen and local officials'.¹³ All these countries were among the 60 with a score of less than 3 out of 10, indicating a high degree of corruption. Some think that corruption in less developed countries may stimulate economic growth. Samuel Huntington argues that 'corruption produced by the expansion of governmental regulation may help to stimulate economic growth... In terms of economic growth, the only thing worse than a society with a rigid, overcentralized, dishonest bureaucracy is one with a rigid, overcentralized, honest bureaucracy'.¹⁴ Many disagree, however, that there is a positive correlation between corruption and economic growth.

For example, Paolo Mauro argues that corruption crowds out private investment and thus lowers economic growth.¹⁵

As far as many economists are concerned, small countries seem to face a dilemma. Because of their smallness, they have a very narrow resource base which, along with inaccessibility to natural resources and rich markets in other countries, is said to severely limit their economic structure of production. If, however, geography blesses them with natural resources, a curse will visit them with corruption and other social pathologies, and slow economic growth.

This article argues that neither a country's economic smallness nor a lack of a diverse natural-resource base is a constraint on its economic structure of production. The early development economists considered natural resources an important determinant of a country's production structure; and since geographically small countries have a small natural-resource base, it seemed logical that these economists would argue that small economies would have a narrow production structure. Human agents, however, have made significant advances in the way they produce goods and services, which have become less dependent on natural resources and more and more dependent on knowledge skills.¹⁶ Persons with knowledge skills, assuming the cultural and institutional framework exists, will invent new products that use a minimal amount of natural resources. Furthermore, if a country has an abundance of knowledge skills at competitive prices, it can attract foreign direct investment (FDI) which can help to diversify its economic structure of production. Thus an important determinant of a diversified economic structure of production in any country, large or small, is whether the country has an adequate supply of knowledge skills at competitive prices. No one has put forward a compelling case that knowledge skills in less developed countries will remain perpetually underdeveloped, unless one makes the unusual assumption that peoples in less developed countries are incapable of a high level of scientific educational attainment. Moreover, as the process of globalisation continues, many less developed countries will eventually gain greater and greater access to the markets of the more developed countries. As long as less developed countries have the human agents that can develop products and services for which an international demand exists, or if the knowledge skills of their citizens prove attractive to foreign direct investment, their economic smallness will not be a constraint on their economic structure of production.

Although the analysis in this article is applicable to any small country, the article seeks to determine whether Caricom countries,¹⁷ because of their economic smallness, can have a diversified economic production structure. In fact, it shows that knowledge skills are beginning to make a positive impact on the regional economic structure of production. It begins with a discussion of economic size. It then examines the claim that geography and climate ultimately determine a country's economic structure of production. It concludes that, in a world where economies are becoming more and more open and production processes are becoming more and more knowledge-intensive, a small country, if it can accumulate the knowledge skills, can have a diversified economic production structure, independent of its natural-resource base.

Economic Size

An article that focuses on the economic size of nations should discuss the meaning of the concept. One may define the economic size of a country in terms of its population, its physical size, its gross national product or some combination of these variables; and a country may be considered small or large depending on which variable is used. For example, when economic size is defined in terms of population, Guyana is a small country—it has a population of fewer than two million persons—but when it is defined in terms of physical size, Guyana may be considered a large country, almost the size of the UK.

Population is the variable economists most frequently used to define the economic size of a country. Kuznets defined a country as small if it had fewer than 10 million persons,¹⁸ and Perkins and Syrquin if it had fewer than 50 million persons.¹⁹ Defining economic size in terms of population means that a small country today can become large over time, making it possible for firms to construct plants of optimum size and to exploit economies of scale based on the domestic market. Kuznets' definition of smallness made Ecuador, with a population of 6.9 million in 1975 a small country, but it became a large country in 2002 when its population reached 12.8 million.²⁰ Nevertheless, it is still small according to Perkins and Syrquin's definition of economic smallness. Furthermore, using population to measure a country's size means that a demographically small country can occupy a very large land mass—Chad's population was estimated in July 2006 at just under 10 million but it covers an area of about 1.2 million square miles—and therefore it can potentially be resource-abundant. This means that it can potentially have a very diversified economic structure of production, which Kuznets said a small country would probably not have.

William G Demas argued that a small country has fewer than '5 million persons and 10 000 to 20 000 square miles of usable land'.²¹ His definition of smallness might have been influenced by the fact that he came from a region whose countries are indeed very small, so small that a French president once derisively referred to them as 'specks of dust'. According to his definition, the Caricom country of Guyana poses a problem in that its population is smaller than five million persons, but its land mass exceeds 20 000 square miles. With a few exceptions, Demas's definition fits Caricom countries. Their markets are too small demographically to permit the establishment of the optimum scale of modern plants producing exclusively for the local market and their land mass is too small to allow for a diversity of natural resources from which to develop a diversified economic structure of production.²²

The size of a country's population changes over time and, therefore, any number chosen as a measure of demographic size is arbitrary. Since most Caricom countries are very small geographically and demographically, and few of them will ever have a population exceeding five million persons in the near future, Demas's definition of economic smallness seems appropriate. One might, however, add to his definition gross national product (GNP) per capita. Downes found that, although they had larger land areas and larger

populations, China and the former USSR were of smaller economic size than the USA,²³ suggesting that the variable GNP per capita contributes to a country's economic size.

Applying Demas' criteria of economic smallness, only two Caricom countries, Guyana and Suriname, are not geographically small. As Table 1 shows, Guyana has a land area of 83 000 square miles, Suriname a land area of 63 251 square miles. The other Caricom countries are small. Montserrat, with a land area of 40 square miles, is the smallest. Trinidad and Tobago, one of the more developed countries in Caricom, has a land area of 1980 square miles.

The populations of Caricom countries are also small. Guyana, the country with the largest land area, had a population in 2002 of 774 800, giving it a population density of about nine persons per square mile. Its population density made it the second least densely populated country after Suriname, which had a population density in 2001 of about seven persons per square mile. Haiti had a population in 2000 of about 8 357 000. Of the English-speaking Caricom countries, Jamaica had the largest population, of 2 641 600, in 2002. Barbados had a population of about 270 000 in 2002. Given its land area of 166 square miles, Barbados had a population density in 2002 of about 1626 persons per square mile and it thereby maintains its reputation, acquired since colonial times, as one of the most densely populated countries in the world.

The World Bank classifies countries as high-income, middle-income and low-income according to their income per capita.²⁴ A high-income country in 2002 had an income per capita of US\$9076 or higher; a middle-income country had an income per capita of \$736–9075; and a low-income country had an income per capita of \$735 or lower. Using the World Bank

TABLE 1. Indicators of economic size

Country	Area (sq mi)	Mid-year population (2002)	GDP per capita US\$ (2002)
Antigua and Barbuda	171	76 485	10 449
The Bahamas	5382	312 000	15 797
Barbados	166	270 800	9423
Belize	8867	265 200	3332
Dominica	290	71 079	3438
Grenada	133	102 638	4060
Guyana	83 000	774 800	937
Haiti	10 714	8 357 000	415
Jamaica	4244	2 641 600	3008
Montserrat	40	4501	
St Kitts and Nevis	104	46 710	7745
St Lucia	238	159 133	4124
St Vincent and the Grenadines	150	109 164	3082
Suriname	63 251	441 356 (2001 ^P)	2199
Trinidad and Tobago	1980	1 282 447 (2003)	7384

Sources: www.caricomstats.org; United Nations Development Programme, *Human Development Report 2004*, New York: United Nations, 2004.

Note: ^P = provisional.

classification, three Caricom countries, Antigua and Barbuda, The Bahamas and Barbados were high-income countries in 2002; one country, Haiti, was a low-income country; all the other countries were middle-income countries. Despite the income criterion, which places Antigua and Barbuda, The Bahamas and Barbados in the category of high-income countries, all Caricom countries are still considered less developed countries, with Haiti ranked among the least developed. Irrespective of the criteria used, there can be no denying the fact that Caricom countries are indeed small. The question is whether their economic smallness precludes a very diversified economic structure of production.

Geography and Climate

The early economists argued that small countries have a narrow resource base that sets a very low limit on their economic structure of production. And since most of the small countries lie in the tropics, it seems the early development economists were implicitly arguing that geography and climate determine a country's economic structure of production. Some of the classical economists suggested a link between geography and climate and economic prosperity. Adam Smith said that 'all the inland parts of Africa, and all that part of Asia which lies any considerable way North of the Euxine and Caspian seas . . . seem in all the ages of the world to have been in the same barbarous and uncivilized state in which we find them at present'.²⁵ Thomas Malthus, however, was not so sure any link existed. He said 'it is possible . . . that the heat of the climate in these lower regions of New Spain, and an inferior degree of healthiness compared with the higher regions, though by no means such as to preclude a full population, may have assisted in keeping them poor and thinly peopled. But when we ascend the Cordilleras, to climates which seem to be the finest in the world, the scene which presents itself is not essentially different.'²⁶

Many postwar economists seemed to be influenced more by Adam Smith than by Thomas Malthus on the subject of climate and economic prosperity. Benjamin Higgins said that 'the great majority of less-developed countries . . . are in the tropics and no tropical country has as *yet* graduated into the ranks of advanced countries'.²⁷ PT Bauer said 'material backwardness is heavily concentrated in extreme climates, and especially in the tropics. This would suggest, *prima facie*, that prolonged residence there, especially when it involves domicile over centuries or millennia, affects adversely the determinants of material progress.'²⁸ Climate, he believed, can have an adverse impact on the mental and physical capacities and attitudes of some segments of the population.²⁹ More recently Jeffrey Sachs argued that geography sets a limit to how far less developed countries can reduce the income gap between themselves and the more developed countries and he predicts that for many less developed countries the income gap between themselves and the more developed countries will become wider.³⁰ Furthermore, Sachs believes, tropical location has certain concomitants—pests, unreliable rainfall, poor and fragile soils, an enervating climate and infectious diseases—that

condemn small less developed countries, the majority of which lie in the tropics, to a very low level of agricultural evolution. History, he says, shows that ‘sustained agriculture-led development . . . has always been a temperate-zone affair’.³¹ History may show that sustained agriculture-led development has so far been confined to temperate regions, but what it also shows is that tropical agriculture in many less developed countries was diverted from the course which agriculture followed in the now more developed countries—producing food and non-food commodities for the local economy, producing inputs for local industry and exporting surpluses—and which could have potentially allowed it to become a force for development.

Those who assert that climate is responsible for the low level of agricultural development in less developed countries tend to ignore the colonial experience. The low level of agricultural development in many less developed countries today may have less to do with climate than with their colonial experience. As colonies, a political status from which most of them emerged only in the second half of the 20th century, their economic structure was conditioned by metropolitan demand and became inordinately dependent on the production of a very narrow range of unprocessed commodities for export to the more developed countries;³² and if colonial commodities were processed into higher products and exported to metropolitan markets, they were heavily taxed by metropolitan governments. Eric Williams wrote that ‘colonial refined sugar in England was . . . charged three to four times the duty levied on brown sugar, on the basis that four pounds of brown sugar were needed to make one pound of refined’.³³ France adopted a similar commercial policy towards refined sugar exported to France from its colonies. Had metropolitan countries allowed the refining of raw sugar in the colonies, many of their industries—shipping, manufactures, coal and food—would have been adversely affected and their governments would have lost much revenue. Whereas metropolitan countries gained by adopting commercial policies that discouraged the colonial refining of cane sugar, Caribbean colonies lost secondary and tertiary income and employment that could have resulted from the refining of raw sugar at its source of production. The colonial refining of cane sugar could have stimulated related industries that would have helped to broaden the economic structure of production of Caribbean countries.

It would be a mistake to assume that colonial agriculture was always monocultural. One of the many tragedies of early colonisation was that domestic agriculture—food production to satisfy the subsistence needs of local populations—was sacrificed for monocultural agriculture to satisfy the demands of metropolitan economies. Fieldhouse said that ‘the real criticism that can be leveled against colonial governments is thus that they put pressure on Africans to grow crops for export in some regions where it was uneconomic to do so as an alternative to growing food for their own subsistence’.³⁴ The small countries of Caricom, too, were encouraged to grow commodities for export as an alternative to growing food for their own consumption. It may be difficult today to convince anyone unfamiliar with the early history of colonisation in Barbados that that small island once had a

relatively diversified agricultural sector. Richard Dunn wrote that, when Sir Henry Colt visited the island, he recorded that 'everything sprouted phenomenally fast and luxuriantly. Figs, oranges, lemons, pomegranates, pineapples, prickly pears, peppers, papayas, sour-sop, watermelons, muskmelons, guavas, plantains, cassava, cloves, and cinnamon were all growing on the island.'³⁵ No wonder that in 1634, fewer than 10 years after it was settled, Barbados was referred to as the granary of all the British Caribbean islands.³⁶ In addition, Barbadians 'cultivated tobacco and cotton for export and wheat and corn for their own consumption'.³⁷ Nevertheless, three decades later the island was dependent on food supplies from England, Ireland and North America.³⁸ The food dependence of Barbados and the rest of the British Caribbean could have been reduced if such a course of action had not violated the fundamental principle of complementarity in production on which the metropolitan-colonial economic relationship was based. Oliver Cromwell, at a loss as to why provisions should be sent from England to a country such as Jamaica that abounded in all things, ordered that Jamaica should take steps to grow crops that would produce bread and other food.³⁹ But when a proposal came before the British Parliament in 1698 to ban the export to the West Indies of corn, meal and flour, along with other commodities, it was rejected on the grounds that the residents in the colonies might start producing provisions for themselves instead of producing sugar cane, cotton and indigo to the detriment of British interests.⁴⁰ Other colonial powers adopted similar policies to protect their domestic food producers. It was more economically beneficial to metropolitan countries to have their colonies produce for export to metropolitan markets tropical commodities that could not be produced in metropolitan countries than to grow food in the colonies to satisfy local needs.

Metropolitan policies encouraged a monocultural pattern of agriculture in the Caribbean and they have played no small role in contributing to the low level of food production that has been a feature of Caricom countries for centuries. It is impossible to know whether in the absence of prejudicial metropolitan policies Caricom countries, like temperate-zone countries, would have developed a much more vibrant and diversified agricultural sector and whether they would have developed an agro-industrial sector as the more developed countries have done. But one can surely make a case that agriculture in these countries would have followed a positive evolutionary path as it has in the now more developed countries—producing food and non-food commodities for the local economy, producing inputs for local industry and exporting surpluses. But to suggest that climate, disease and the environment are responsible for the low level of agricultural evolution in less developed countries is to ignore their colonial experience and the path dependence such an experience engendered.

Not all analysts agree with the assertion that tropical countries, because of their geography, are destined to have a low level of agricultural development and that the tropical environment is so disease-ridden that progress there is retarded or even prevented. Nor are they unmindful of the impact of the colonial experience on agriculture in less developed countries. JM Blaut, for

example, argues that the agricultural condition in Africa 'reflects cultural causes from recent history or colonial history. It does not reflect inherent limitations of tropical agriculture and it does not reflect technological ignorance on the part of farmers'.⁴¹ Furthermore, he argues that 'most of the important diseases of humans and their domesticated animals are *not* peculiarly tropical' and even some supposedly 'tropical diseases' have been found in non-tropical places.⁴² Some of the so-called tropical diseases that are said to retard the positive evolution of agriculture in sub-Saharan Africa may be traced to the depopulation of Africa in colonial times and the massive expansion of wastelands that followed.⁴³ It is difficult to accept the implicit assertion that tropical diseases are not susceptible to advances in knowledge that can pave the way for tropical agriculture to be put on a sound footing.

Those who believe that climate and geography will ultimately determine a country's agricultural development underestimate the power of knowledge skills to transform the economic structure of production. People living in the tropics can develop crops that never before grew in their environment. Christine Gorman says that since the 1990s West African scientists have created 'high-yielding varieties of rice that are well adapted to the dryer conditions of upland regions... [T]he plants were created through conventional breeding of a high-yield Asian variety with a hardier African one—something that had been tried many times before without success'.⁴⁴ In addition, human agents can change hostile environments and make them agriculturally productive as they have done in some countries by transforming, for example, desert or marshy land into productive agriculture and thereby diversifying their agricultural sector. Furthermore, one cannot ignore the fact that nature sometimes works in mysterious ways. Scientists report that African deserts are in retreat and that a regeneration of the vegetation is taking place. The reasons for the regeneration of the vegetation are not known with certainty, but 'farmers have been adopting better methods of keeping soil and water on their land' by a technique known as 'contour bunding'.⁴⁵ It is evident that the application of scientific knowledge can result in crops being grown in places once thought inhospitable to agriculture and that nature can assist in making an environment friendly to the practice of agriculture. If less developed countries have a low level of agricultural development, one should look more to a shortage of knowledge skills and the historical experience rather than to climate.

When discussing the role of natural resources in determining a country's economic structure of production, the early development economists placed too much emphasis on the presence of natural resources within national boundaries and not enough attention to accessibility to natural resources wherever they might be. Lewis considered accessibility a 'resource',⁴⁶ but he meant accessibility to natural resources within national boundaries. A country's production structure, however, does not have to be entirely dependent on its natural-resource base if the country has access to extraterritorial natural resources.

Accessibility to colonial resources helped to determine the economic structure of production in many metropolitan countries during the 18th and

19th centuries. Eric Williams said 'that the processing of colonial raw materials gave rise to new industries in England . . . Of these raw materials [cane] sugar was pre-eminent and its manufacture gave birth to the sugar refining industry'.⁴⁷ A similar thing happened in France. England exported cane sugar,⁴⁸ but it grew no sugar cane. Lipson said 'it was estimated that before England had any sugar plantations of her own she paid Portugal a great sum per annum for sugar, whereas now she not only supplied her own wants but exported large quantities abroad'.⁴⁹ Likewise England produced no cotton but, because of the accessibility of raw cotton primarily from the West Indies, the Levant and the Southern States of America, the county of Lancashire became home to the English cotton industry and cotton exports became a significant proportion of the English export trade. It was because of Britain's access to this extraterritorial raw material, along with its knowledge skills, that Phyllis Deane could write thus of the English cotton industry: 'For the first time in history a great staple industry had been established on the basis of a natural resource that could not be domestically produced'.⁵⁰ If England were half its present size without any natural resources within its boundaries, but with access to all those resources, human and natural alike, which enabled it to be the first country to experience an industrial revolution, it would still have a diversified manufacturing economic structure of production. Japan is resource poor, but it has a diversified manufacturing structure of production. Given a country's knowledge skills, accessibility to, rather than the location within national boundaries of, natural resources may be a more important determinant of economic growth and the economic structure of production.

Unlike the more developed countries that have traditionally had access to natural resources in less developed countries and that have the material and immaterial capital to transform natural resources into products to satisfy human wants, less developed countries do not usually have access to natural resources outside their territorial boundaries. This inaccessibility, along with a shortage of material and immaterial capital, may help to explain why the economic structure of production in less developed countries is not very diversified. Linking a country's production structure to its natural-resource base is suggestive of environmental determinism and, since most small less developed countries lie in the tropics, of geography as destiny. To take such a position reflects scepticism in the ability of human agents to apply scientific knowledge to the solution of problems.

Geography has not blessed many individual Caricom countries with an abundance of known natural resources; nevertheless, if the region is taken as a single entity, its resource endowment compares favorably with that of some countries considered more developed. The Commonwealth Caribbean Regional Secretariat noted that the region possesses bauxite, asphalt, oil, gas, fisheries, forestry, good agricultural lands, and earth and sands for building materials such as cement and iron ore.⁵¹ The regional resource base is surely broader than that of Singapore and can potentially contribute to a diversified economic structure of production. And although Caribbean economists have advised Caricom governments to integrate the regional natural-resource base because it will bring greater benefits to the region than

if each country goes it alone,⁵² Caricom countries have not distinguished themselves in the area of economic co-operation—or political co-operation for that matter—by pooling natural resources together for the regional good. Thus proposals to accelerate industrial development through industrial programming, whereby Caricom countries will collaborate to develop their natural resources,⁵³ have not received serious consideration from Caricom governments. Unfortunately for them, as it is for most less developed countries, Caricom countries with known natural resources have not been able to transform their natural resources into higher products nor to diversify their economic structure of production. Instead, they have become rentiers, living off the royalties and taxes received from capitalists they have imported to develop their natural resources.

I am not suggesting that the importation of capitalists is inimical to the positive evolution of a country's economic structure of production. One may find several examples of foreign industrialists stimulating the growth of manufacturing in many countries. Alfred Marshall acknowledged the important contribution of immigrants to the development of manufacturing in Britain. He said that 'the greater part of England's manufacturing industry before the era of cotton and steam had its course directed by settlements of Flemish and other artisans... These immigrants taught us how to weave woollen and worsted stuffs... They taught us... how to manufacture silk, how to make lace, glass and paper.'⁵⁴ Recently foreign entrepreneurs have made a significant contribution to the development of Silicon Valley—no silicon is known to exist in that valley—and thus to the US economy. There is no doubt that countries can gain by importing capitalists who can help to diversify a country's economic structure of production.

Knowledge skills and the economic structure of production

A country's geographical size determines its natural-resource base and thus a geographically small country will in all probability have a narrower such base than a large country. A narrow natural-resource base was thought to be a significant constraint on the ability of a small country to have a diversified economic structure of production. Moreover, since most small countries lie in the tropics, their climate, along with diseases said to be peculiar to tropical regions, has been considered an additional constraint. I have argued against these assertions. There is no inherent reason a small country cannot have a diversified economic structure of production. Ireland and Switzerland are relatively small countries, with precious few natural resources, but their economic structure of production is much more diversified than that of the Democratic Republic of Congo, a relatively large country with an abundance of natural resources. Their manufacturing sector is heavily knowledge-based, whereas that of the Democratic Republic of Congo is not. Likewise extremely small city-states such as Hong Kong and Singapore, with few natural resources, have diversified economic structures of production.

The presence of natural resources is not a sufficient condition for a country to have a diversified economic structure of production. Countries must have

the knowledge skills to transform natural resources into useful products. Without the application of knowledge to their transformation into useful products, natural resources are intrinsically useless and will not effect a diversified economic structure of production in any country. That the application of knowledge is the critical element in determining whether a resource is useful, and thus in determining a country's economic structure of production, was mentioned by Thorstein Veblen (1908) about 100 years ago in his classic article, *On the Nature of Capital*. He noted that humans domesticated various kinds of animals and food crops for their use and that:

these things, of course, are useful because men have learned their use, and their use, so far as it has been learned, has been learned by protracted and voluminous experience and experimentation, proceeding at each step on the accumulated achievements of the past. Other things, which may in time come to exceed these in usefulness are still useless, economically non-existent, on the early levels of culture, because of what men in that time have not yet learned.⁵⁵

Lewis made a similar point when said that 'when we say that a country is rich in resources the statement has meaning only in relation to contemporary knowledge and techniques'.⁵⁶ The physical properties of raw materials do not change; it is humans, through knowledge accumulation, who change and make resources useful.⁵⁷ This fact may help to explain why some countries are more economically advanced than others. The more developed countries are improving at a rapid rate the quality of their knowledge skills, whereas less developed countries are not. Oil, bauxite, tin, copper, coal, iron ore, etc, are natural resources and they create wealth because knowledge has been applied to them to make them useful. Human agents with the requisite knowledge skills have transformed these natural resources into useful products and helped to diversify the production structures of those economies where these resources are transformed into higher products. A large country can be abundant in natural resources, but if it does not have the human agents with the knowledge skills to transform them into products it will not have a diversified structure of production. On the other hand, a small country can be deficient in natural resources, but if it has the human agents with the knowledge skills it can have a diversified economic structure of production.

The history of the more developed countries provides ample evidence of the power of knowledge skills to diversify the economic structure of production. Indeed, an important part of their history is the application of knowledge to the production of goods and services. In a recent study Gavin Wright and Jesse Czelusta stated that the USA was at one time not considered rich in natural resources but, through the application of scientific knowledge to the transformation of resources into useful things, it became a minerals economy and 'the condition of abundant resources was a significant factor in shaping if not propelling the US path to world leadership in manufacturing'.⁵⁸ The mineral intensity of its manufacturing exports increased sharply between 1879 and 1914; and between 1850 and 1919 nine of 20 of its manufacturing industries displayed a significant materials-using

bias in technological change.⁵⁹ Furthermore, ‘by the late nineteenth century, the US emerged as the world’s leading educator in mining engineering and metallurgy. The early leader was the Columbia School of Mines, opened in 1864; some twenty schools granted degrees in mining by 1890.’⁶⁰ The fact that resources were being found to be useful encouraged others to investigate the usefulness of other resources and thus fostered the growth of knowledge skills.

To underscore the importance of knowledge skills in transforming a country’s economic structure of production, let us take another example from the USA. Discussing the contribution of oil to the industrialisation of the USA, Gerald Gunderson wrote that a Yale chemistry professor, Benjamin Silliman, Jr, ‘showed that petroleum could also serve as a lubricant... Oil was not difficult to find because for some time it had been a *messy nuisance* in mining operations, especially in mining for salt’.⁶¹ He also said of oil refiners:

At first [they] were concerned only with obtaining kerosene, the so-called middle of the barrel, and [they] considered the lightest distillate (naphtha) and the heaviest ones (heavy oil and paraffin) as *little more than trash*. By 1880 much of the lighter grades were being converted into lubricating oil, which was particularly valuable as faster and heavier machinery outpaced such traditional lubrication materials as animal and vegetable fats. The refiners also found that the heavier distillates could be converted into heating or fuel oil, which proved to be particularly salable in those areas which were farthest removed from coal supplies.⁶²

Thus a resource once considered ‘a messy nuisance’ and ‘little more than trash’ became a resource of paramount economic significance as the application of scientific knowledge made it useful. The USA had the scientific knowledge, in addition to other elements, to transform a ‘useless’ resource into useful products to meet human needs and to broaden its economic structure of production.

Knowledge skills can turn what many think to be useless things into useful products and they may even lead to the development of products to exploit natural resources, which can help to diversify a country’s economic structure of production. But, contrary to the prevailing view in the years immediately after World War II, the presence of natural resources is no longer so indispensable to a country’s manufacturing economic structure of production. One reason is that raw materials are playing a smaller and smaller role in production processes, while knowledge skills have become the main input.

Umberto Colombo writes that ‘throughout history there has been a direct correlation between increases in gross domestic product and consumption of raw materials and energy. This is no longer automatically the case. In today’s advanced and affluent societies, each successive increment in per capita income is linked to an ever-smaller rise in quantities of raw materials and energy used’.⁶³ The United Nations made a similar observation. Noting the development of new materials and their growing displacement of old materials in production processes in the more developed countries, it

predicted that the trend will continue and will 'reduce the growth of demand for such traditional materials as copper, zinc, tin, bauxite, and aluminum'.⁶⁴ It urged producers of primary materials, primarily less developed countries, to shift 'the production of traditional raw materials to more knowledge-intensive materials'.⁶⁵ The newest resource, information, is completely knowledge-intensive and is becoming the main input in production processes.⁶⁶ If knowledge skills are resulting in the creation of new materials, displacing old traditional materials, and if knowledge is becoming the main input in production processes, it seems that economic smallness has lost its relevance in determining a country's economic structure of production. The accumulation of a large and high-quality pool of knowledge skills is more essential to a diversified economic structure of production than the presence of natural resources. One can think of countries such as South Korea and Taiwan that not too long ago had a narrow economic structure of production, specialising in light manufactures for export. Thanks in part to their accumulation and application of knowledge skills to production processes, they now have a diversified economic structure of production and have become formidable competitors with the more developed countries in the production of many manufactured products.

Knowledge skills played no small part in the development of the computer, which has transformed production processes and has given rise to new industries even in countries that do not have the ability to develop and manufacture computers. If a small economy without the presence of an abundance of natural resources had the knowledge skills and other resources to develop the computer, it would have had an enormous impact on that country's economic structure of production. A new technology that could become a pole of economic growth in the 21st century is emerging and it is nanotechnology. Nanotechnology may become to the 21st century what computers were to the 20th. KE Drexler defines nanotechnology as 'technology based on the manipulation of individual atoms and molecules to build structures to complex, atomic specifications'.⁶⁷ This new knowledge-intensive technology seems to offer endless possibilities, including the molecular repair of the human body and the replacing of transistors and other devices with nanotubes. It will affect every industry engaged in manufacturing products.

Knowledge skills can help to broaden a country's economic structure of production by means of FDI. Production processes are becoming more and more knowledge-intensive and many firms, to remain competitive, are locating segments of their production processes, if not entire production processes, in countries with abundant knowledge skills at competitive prices. Long said that several foreign-invested enterprises (FIEs) in China 'have established R&D centers in regions where colleges and universities exist so that they can recruit talent at lower cost than in other countries'.⁶⁸ Novartis announced plans to build a new research facility in Shanghai to create new drugs for which there is strong demand in China in particular and in Asia in general.⁶⁹ Such FDI can have positive technological spillovers to the rest of the economy. According to Long, 'foreign investment has provided China's

domestic enterprises with a manufacturing base from which to develop new products... ZTE Telecommunications Co, Ltd, an emerging telecommunications equipment manufacturer based in Shenzhen, [has developed and is producing] a huge quantity of highly competitive products'.⁷⁰ When the mobile equipment market emerged in China, the equipment and the mobile phones were imported or produced by foreign firms operating in China; but in 2003 Chinese enterprises had captured about 60% of the mobile phone market.⁷¹ Not all small countries may be able to realise such technological spillovers to spawn new industries or stimulate existing industries; but with knowledge skills they can potentially attract segments of production processes that can result in the growth of new industries.

The argument that natural resources determine a country's economic structure of production suggests that there is some set of preconditions that must be present for economic transformation to take place. But the forces making for economic transformation in some countries may deviate from prerequisites that are believed to be uniform. One finds that private wealth played no small part in effecting an industrial revolution in Britain; however, the state and the banking system provided much of the capital for the early industrial development of some European countries. Merchant capital might have helped to propel the British economy into an industrial age, but many students of economic change in the Caribbean view merchant capital as an obstacle to economic transformation. What can be said with some degree of certainty is that countries without knowledge skills do not stand a very good chance of having a diversified economic structure of production.

In the past some countries that lacked certain skills overcame the shortage partly through immigration. Most, if not all, of the engineers and agricultural scientists working in the colonies came from metropolitan countries. Today, the more developed countries are importing highly-skilled workers to fill shortages, although their firms are also locating abroad some knowledge-based segments of production processes. It is highly unlikely that knowledge workers from the more developed countries, unlike the adventurers of the early colonisation period who hoped to strike it rich in the colonies and return home very wealthy, will migrate to very small countries such as those of Caricom and try to develop new industries. Caricom countries, therefore, must create a large pool of knowledge workers that can help diversify their economic structure of production. Peoples with knowledge skills can become entrepreneurs and establish new industries. Many Caribbean nationals with various engineering degrees have established their own businesses, something unheard of during colonisation, providing engineering services to regional businesses and governments or forming joint ventures with foreign firms doing business in the region. Fluor Corporation, a US-based Fortune 500 company and 'one of the world's largest, publicly-owned engineering, procurement, construction and maintenance services organizations', has combined with a Trinidadian company 'to form a new firm [in Trinidad] to provide cost-effective engineering, procurement, construction and maintenance services in Trinidad and neighboring countries using primarily Trinidadian resources'.⁷² The University of Windsor has signed an agreement

with Kanata Chemical Technologies (KCT) Inc supporting research which, if successful, 'will permit the utilisation of ammonia under economic conditions for the manufacturing of petrochemicals and pharmaceuticals. This . . . could provide a significant opportunity for the development of those industries in line with Trinidad's [and Tobago's] quest to create more value-added on the island using its natural gas and offshoot products such as ammonia'.⁷³ There are also other instances where knowledge skills are helping to diversify the production structure of Caricom economies.

Take the solar industry in Barbados. It was only within the past 30 years or so that Barbadians attempted to harness the sun's rays to help provide energy. Until recently they did not have the immaterial capital to do so. Or if they had the immaterial capital, it was not directed to researching the uses to which solar energy could be usefully applied. The sun's rays were of economic value as a tourism export, but not as a resource for making commercially useful products. However, Barbadian entrepreneurs, using technology developed at the University of the West Indies, have been able to use solar energy to provide hot water to Barbadian homes and buildings, to power ice makers, lamps and radios and to provide lighting for large playing fields. The application of solar energy to power ice makers is helping to reduce the energy costs of deep-sea fishing and is enabling Barbadian fishermen to exploit more intensively the rich fishing resources of the Caribbean Sea and the Atlantic Ocean. In addition, Barbadians may soon use solar energy for refrigeration and cooking. A Barbadian solar engineer has also designed 'solar dryers for drying peppers in Antigua, and for wheat and wood in Barbados'.⁷⁴ Also, it was reported in the Barbados *Daily Nation* that a Barbadian company, Aqua Sol, 'has partnered with Nigerian public and private sector interest to set up a multi-million-dollar solar water heating plant in that African nation'.⁷⁵ Thus Barbados is exporting solar-heating services.

A Barbadian chemist has recently said that Barbados can help to reduce its dependence on imported oil by adopting gasification technology. Gasification, which can act on a range of raw materials and biomass, produces syngas, which can be used as fuel and which can help to reduce greenhouse gas production. An advantage of gasification to Barbados is that the country will use its own resources.⁷⁶ The technology is not fully commercialized and most of the research is being done in the more developed countries. But, as with solar energy, it is an area where the University of the West Indies and Caricom governments may wish to transfer more resources to research and development and help to broaden the regional economic structure of production. Likewise, a Barbadian company has obtained approval from the Government of Guyana to bring under cultivation in that country about 400 000 acres of palm oil plants to produce biodiesel. The refining of the product is to be undertaken in Barbados and Guyana.⁷⁷

Barbados and Trinidad and Tobago are not the only Caricom countries where knowledge skills are helping to diversify the economic structure of production. It has been reported that researchers in Jamaica are trying to develop ethanol to help meet the energy challenge brought about by the high cost of energy. Scientists have identified two Jamaican plants with properties

that have the potential to cure five cancers.⁷⁸ The scientists, one based in Jamaica and the other at the University of Maryland, are very optimistic about their findings and they hope commercial production will start in Jamaica in about five years. Even with the promise of the Jamaican government to provide funds and help raise funds from the Jamaican private sector for the research, the scientists may be over-optimistic in thinking that their new product will be ready for commercial production in five years. Nevertheless, the commercial production in Jamaica of drugs embodying the properties of the two native plants will lead a local pharmaceutical industry that will help to diversify the economic structure of production of that country. The scientists may have to partner with a firm from a more developed country, but so long as the product is being produced in Jamaica it will have an impact on the production structure of that country. What is significant about this development is that residents of Jamaica have been aware of the existence of these plants since colonisation but no one, it seems, knew that they could be sources of useful commercial products. Jamaica, however, now has the knowledge skills to make these plants commercially useful. Technological advance 'is both encouraged and limited by the prevailing economic and social milieu and its ruling interest',⁷⁹ but if the economic history of the more developed countries is any guide, it is very unlikely that the scientific achievements originating in Caricom will be introverted. A more likely outcome is that these achievements will stimulate in related or other areas further scientific advances whose cumulative effect can have a positive evolutionary impact on the economic structure of production of local economies.

The aforementioned examples show that knowledge skills can broaden a country's economic structure of production. The more diverse and larger the pool of knowledge skills available to a country, the more likely the country will have a broad diversified economic structure of production. If Caricom countries lack a diversified economic structure of production, it is not because of their smallness or lack of natural resources, but because of their paucity of knowledge skills. Adam Smith said the division of labor is limited by the extent of the market;⁸⁰ and CE Ayres said that the extent of the market is limited by the state of the industrial arts.⁸¹ I argue that the extent of a country's economic structure of production is limited by its knowledge skills.

Conclusion

The early development economists assumed that economic size set a limit to a country's economic structure of production. The larger the country the more diversified would be its economic structure of production and the smaller the country the narrower would be its economic structure of production. Their argument rested on the existence of economies of scale, natural resources and the uncertainty of foreign markets. A large country would most likely have a large domestic market that would allow industries to fully realise economies of scale and, because of its geographical size, it would also probably have a diversified natural resource base that would lead to a diversified economic structure of production. The evolution of the global

environment, however, and of production processes in particular has vitiated these arguments.

Globalisation is increasingly opening up markets to all countries and production processes are becoming less and less dependent on natural resources and more and more dependent on knowledge skills. A country's progress to a more diversified economic structure of production is to be found more in the quality of its human material than in its natural resources. Thus the challenge facing small countries is how rapidly they can increase their knowledge skills to develop new products and services for which an international demand exists. Moreover, since many firms from the more developed countries are prepared to outsource certain segments of their production processes to any country that has the requisite inputs, a high-quality pool of knowledge skills at competitive prices can attract foreign firms to a small country and broaden its economic structure of production.

Notes

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