THE CARIBBEAN DEVELOPMENT BANK AND POVERTY REDUCTION: A MACRO ANALYSIS

by

Roland Craigwell
Central Bank of Barbados
P.O. Box 1016
Bridgetown
Barbados

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Abstract

Over the last two decades or so, most Caribbean countries have enjoyed a relatively good standard of living, compared with other countries of the world. Indoor running water and electricity, television sets and telephones, gas stoves and refrigerators are now commonplace in most Caribbean households. Improvements in real disposable incomes and access to various forms of credit and other financial resources are also widespread. Despite these advancements, a vast number of Caribbean people still live in a state of poverty. In 1993, the World Bank estimated the number of poor people to be of the order of 38% of the total population.

The Caribbean Development Bank (CDB), guided by one of its mandates to reduce the levels of poverty in its member countries, has endeavored to provide funding to those borrowing member countries who need it the most. Since 1984, the CDB through its Special Development Fund has disbursed nearly US$400 million to this end.

Given the vast amount of financial and other resources being invested in the Caribbean region, this study examines whether the CDB funding to its borrowing member countries (as a single entity) has contributed significantly to the overall reduction of poverty. More specifically, it provides a macro econometric analysis of the CDB funding on overall poverty levels in the Caribbean and outlines the theoretical underpinnings of the likely impact of injecting additional funds in a particular investment. This approach was never explored in previous studies of this nature.

The findings which are based on cross-section and pooled data suggest that the CDB funding, through its special resource facility, has had a direct effect on the overall reduction in the level of poverty. However, this effect has been small. This outcome also suggests that the CDB would have to invest a substantial amount of funds into its

borrowing member countries to increase the impact on poverty eradication - for a one unit change in the poverty index (defined broadly) the CDB would have to invest between US$15 million and US$70 million, depending on the poverty index and funding mechanism utilised. This result is explained as a consequence of the high quality of life present in many of the Caribbean countries - most of the poverty reduction has occurred already so it becomes more costly to decrease poverty further.

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THE CARIBBEAN DEVELOPMENT BANK AND POVERTY REDUCTION: A MACRO ANALYSIS

1. Introduction

One of the mandates of the Caribbean Development Bank (CDB) is to contribute to the reduction of poverty in its member countries (see CDB(1996b)). It has attempted to do this, inter alia, through the creation of special resource funds like the Special Development Fund (SDF) and the Basic Needs Trust Fund (BNTF) which provide economic support for infrastructure and productive projects. Indeed, since 1984 the amount of money disbursed from the SDF totaled nearly US$400 million covering a wide range of projects in all of the CDB borrowing member countries (see CDB (1996c)). With such a vast amount of resources being invested in Caribbean economies, an analysis of the direct impact of the CDB funding on poverty seems warranted. In this regard several independent studies have been done, all utilizing a micro (project) approach as their evaluation device, that is, they focused on the benefits derived from the *individual* projects that the CDB provided funding for (see CDB(1996a,b)).

This present study will take a different slant by moving away from the micro approach of project analysis to a macro approach which looks at the *overall* direct impact of the CDB funding on poverty levels in the Caribbean. Conceptually, this macro approach, unlike the project approach, considers spill-over effects of projects, among other things. However, it does not capture externalities of the CDB financing. Theoretically, it allows for a more formal framework of the impact of funding on poverty. Such a framework provides the necessary rigorous statements about this poverty issue and though may appear complex, is needed nevertheless in conjunction with less formal analysis in order to achieve clarity and precision.

This study begins by taking a brief look at the definition, measurement and trends of poverty in the Caribbean. Secondly, it examines what the CDB is doing to reduce poverty in the region, focusing on the special development funds that target poverty. Thirdly, the project approach that the previous consultants have chosen as their modus operandi is briefly reviewed. Fourthly, the literature on targeting (the task of which is to ensure that poverty assistance actually reaches the neediest) is used to present a theoretical framework that seeks to determine the impact that the CDB funding can

have on poverty. Fifthly, an econometric model where the CDB lending, among other variables, is the explanatory variable, is set up. Sixthly, the results of this model using two sets of data - cross-section and pooled - are presented and evaluated. Finally, some conclusions are made.

In this study it was found that funding provided by the CDB helped to reduce poverty. However, the change in poverty appears to be very small and would suggest that if CDB is to make a considerable change in the plight of the poor a large amount of money would be needed. The fact that Caribbean countries have a fairly high quality of life relative to many of the other countries in the world (see Section 2 below) may partly explain this high cost of marginal reduction in poverty - because most of the poverty reduction has been done already it becomes more costly to reduce poverty further. This result is consistent with what is known about the purely economic impact on poverty in other places (see Morley (1995)) and is also consistent with the targeting literature (see equations (7) and (12)) discussed below in section 5. This result also reflects the need to tackle poverty in a comprehensive manner.

2. Poverty in the Caribbean

Poverty can be defined as the extent to which individuals in society fall below a minimum acceptable standard of living. However, such a definition is still some way from being an operational tool for measuring poverty and comparing it across countries. For a start there is a problem of how to specify a minimum acceptable standard of living in the society. Is it to be a basic nutritional minimum, or is it to be the average standard of living in the society? Is the standard to be specified in terms of consumption bundles and then translated to an income level through appropriate prices?

Four measures of monitoring poverty are available for the Caribbean, namely, the Foster, Greer and Thorbecke (1984) index, the Human Development Index (HDI), the Basic Needs Index (BNI) and the Integrated Poverty Index (IPI). The Foster, Greer and Thorbecke (1984) measure includes the Headcount, Poverty Gap and FGT P_2 indices. The Headcount measure is the proportion of the population whose incomes are below the poverty line. The Poverty Gap is used to measure the depth of poverty for the population as a whole; it represents the amount necessary to raise the income of all poor individuals to the level of the poverty line, as a proportion to the poverty line. The FGT P_2 measure is distribution sensitive in that it gives weight to those who are very poor relative to the "mildly poor". These poverty measures are based on consumption and income data derived from household and community surveys. Such surveys have now been carried out in Jamaica (annually since 1988), Guyana (1988), Trinidad and Tobago (1992), Belize (1995), St. Lucia (1995), St. Vincent and the Grenadines (1996) and Barbados (1997).

Basing the analysis on consumption and income measures has the weakness of excluding important factors like health, life expectancy, literacy, and access to public goods or property resources. The HDI, the IPI and the BNI try to remedy this defect by constructing composite indices of basic components of human development. The HDI calculated by UNDP is comprised of indices of longevity, knowledge and the standard of living; the BNI is designed to integrate indicators of education, health, sanitation and access to safe water in a composite index and IPI attempts to integrate a headcount measure of poverty with income distribution and a discount factor. These latter two indices which come closer to measuring poverty than the Foster Greer and Thorbecke indices and the HDI are developed by the International Fund for Agriculture Development.

In looking at poverty in the Caribbean it should be noted that several of the estimates were calculated using different methodologies and from data in different years. Notwithstanding these issues, Table 1 compiled by the World Bank (1996) implies that approximately 38% of the total population in the wider Caribbean or more than seven million people can be classified as poor. This finding is based on the headcount measure - the Poverty Gap and FGT P_2 indices are unavailable for the majority of Caribbean countries.

While it is difficult to make global comparisons in poverty given the differing methodologies in measuring it, this estimate of the poor would likely place the wider Caribbean below Africa and South East Asia, yet above East Asia and Eastern Europe in terms of poverty levels.[1] The incidence of poverty is highest in Belize, Dominica, Guyana, Haiti, Jamaica and Suriname, although rates are higher than 20 percent in the

[1] Regional averages calculated for 1990 use estimates for 86 countries and a poverty line of approximately $1 per day at US 1985 purchasing power parity. Regional estimates are as follows: Eastern Europe 7.1; East Asia and the Pacific 11.3; Latin America and the Caribbean 25.2; Middle East and North Africa, 33.1; Sub-Saharian Africa, 47.8 and South Asia, 49. See Ravallion, Datt and Chen (1992).

Dominican Republic, St. Lucia and Trinidad and Tobago. Poverty levels are lowest in Antigua and Barbuda, the Bahamas, Barbados, and St. Kitts and Nevis.

The Caribbean countries shown in Table 1 differ from those that the CDB has funded - the CDB has not extended funds to Haiti, Dominican Republic or Suriname. Because these three countries have a fairly high incidence of poverty, excluding these will cause a significant reduction in poverty. For example, omitting Haiti from the group of countries depicted in Table 1 implies that the number of people classified as poor relative to the total population decreases from 38% to 25%.

Now let us look at broader measures of poverty. In 1993, the HDI averaged 0.750, placing the wider Caribbean above the developing countries' average. For countries funded by the CDB the average is 0.789. For individual countries, Barbados was ranked number 20, Trinidad and Tobago (35) and the Bahamas (36). The other two multi-faceted development indices (BNI and IPI) reveal similar patterns to the HDI and are not discussed here. Table 1 provides the necessary details.

Although the static results discussed above provide valuable information it is sometimes useful to take a dynamic look at the data. The only measure that is available over a period of time for all countries is the HDI.[2] Table 2 shows that Barbados has remained at the top between 1987 and 1993 while Haiti has remained at the bottom. Positions for the other countries have fluctuated from time to time. However, most countries in the sample have remained above the developing countries' average during the review period.

3. Poverty Strategies of the CDB

Over the years, the CDB has rendered assistance to the poor in two ways. One, directly into social safety nets. The social safety net system includes: (1) social insurance concerned with the provision of security and the spreading of income over the life cycle; (2) means-tested social assistance (or public assistance) designed to alleviate poverty and (3) categorical transfers directed at redistribution between specific groups. As a result, benefits are provided for a range of target groups: children, low income families, the elderly, the unemployed and the disabled. The World Bank (1996) has suggested that the wider Caribbean countries have spent on average 1.6 percent of Gross Domestic Product on expenditure for safety net programs.

Second, indirectly through the development effort that they undertake which may have an element of protection for the poor in that they focus directly on groups and individuals that have difficulty in accessing certain facilities. In this latter case, the CDB has institutionalized its assistance under the umbrella of the Basic Needs Trust Fund (BNTF).

The first BNTF was established in June 1984 with the United States Agency of International Development (USAID) grant funds and ran until September 1987. The BNTF provided a total of US$28.2 million, with US$19.7 million from the USAID and US$8.5 million from the CDB. Based upon the success of this first program, the *CDB* approved a second program valued at US$21.25 million - US$15 million from the CDB's Special Development Fund (SDF) and an additional US$6.25 million from the beneficiary Governments in counterpart funding for infrastructure and project management. In October 1995, the CDB approved a third program for US$18 million to be matched by local counterpart contributions totaling US$8.6 million (this includes US$1.1 million for managing the program). During the decade these funds have been expended on 550 sub-projects comprising of community water supplies, sanitary facilities, schools, health clinics, roads and drainage, bridges, soil conservation, handicraft centers, reforestation and community markets. The sub-projects generated approximately 242,238 persons weeks of employment. These facts have led independent consultants to conclude that the BNTF has achieved some reduction of poverty through, inter alia, improvement in social infrastructure, mitigation of environmental nuisances, and improvements in social and economic status of lower income groups who have been facilitated in increasing agricultural output and in micro and small enterprise development. In fact, some consultants suggest that the Fund was effective and well received, surpassing the targets for both employment generation and the number of sub-projects implemented (see CDB(1996c)). These evaluations were largely based on the project approach, and as is discussed next ignores spillover effects, among other things.

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[2] Only Jamaica has conducted more than one household living conditions survey (annually since 1988). These surveys indicate that the number of poor has fluctuated because per capita output and consumption have fluctuated. At the same time, poverty has declined in severity because the distribution has become more equal.

4. The Project Approach

The project approach utilized by the previous consultants alluded to in the previous section (see, for example, CDB (1996a,b)) basically shows what *benefits* to the poor are derived from poverty focused projects. This approach fails to address some pertinent issues. For example, it is possible that some projects (construction, for example) though targeted for the poor, may actually benefit the non-poor (engineers and contractors) more than the poor (laborers). Can this then be considered as a poverty reduction project? How do we know that the majority of the number of persons weeks generated by projects went to poor people? Moreover, some of the projects only run for a few months. Can these be considered as poverty reduction given that people are out of work most of the year? Surely this is only a temporary definition of poverty.

In addition, isolating and analyzing one project from the others ignores the spill-over effects that some projects have on others. This is true of the multiplier method of the incremental employment alluded to above. Clearly, a macro econometric approach of the effects of the CDB funding on poverty in the Caribbean is warranted. This approach will give a quantitative estimate of the impact of the CDB funding on poverty and should be seen as complementary rather than a substitute to the project approach. It is complementary also to the more sociologically oriented analysis.

5. Poverty and Funding: A Theoretical Analysis

The studies utilizing the project approach discussed above provides no formal statement of the impact of funding on poverty suggesting that it may not be technically precise. This section gives a theoretical analysis of the impact of funding on poverty. It is based on the targeting literature espoused by Kanbur (1986) where the object is to ensure that the neediest receive the requisite assistance. Assistance here is assumed to be through the direct distribution of subsidies or changes in factor prices and though the CDB do not *directly* partake in this type of assistance program it is done *indirectly through* their programs of providing funds for infrastructure and productive projects.

To begin with, a poverty measure that satisfies the major welfare properties (for example, monotonic and transfer axioms) needs to be specified. The Foster, Greer and Thorbecke (1984) poverty measure discussed above- hereafter , FGT- satisfies such criteria as well as being additively decomposable for mutually exclusive subdivisions of society. The FGT poverty measure can be expressed as

$$P_\alpha = \frac{1}{n} \sum_{i=1}^{q} \left[\frac{z-y_i}{z}\right]^\alpha \qquad (1)$$

or equivalently in terms of the income frequency density (f(y)):

$$P_\alpha = \int_{\bar{y}}^{z} \left[\frac{z-y}{z}\right] f(y)\, dy \qquad (2)$$

where n is the total population (households), q is the number of households below the poverty line, z is the poverty line, y_i is the income of the ith poor household, $\bar{y}$ is the income of the poorest household and α is a parameter to be chosen by the policymaker. With $\alpha = 0$, P_0 becomes the head count ratio, q/n. With $\alpha = 1$

$$P_1 = \frac{1}{nz} \sum_{i=1}^{q} (z-y_i) \qquad (3)$$

that is, it is the gap divided by nz. For $\alpha > 1$ the welfare of the poorest is emphasized and for $\alpha \geq 2$ all conventional social welfare principles are satisfied. In the limit, as α becomes very large, P_α approaches a Rawlsian measure which considers only the position of the poorest household.

Let us now consider what would happen to poverty if the CDB funded several poverty reducing projects. Two cases are considered:

1. ***Additive Distribution***: Benefits received by a given group are divided equally among all households in that group. Thus if total benefits received by group i amounts to B^i then the income of each household in group i increases by an amount $B^i/ n_i = \Delta_i$. Such an additive distribution of benefits might be accomplished through direct equal subsidies to each household.

2. ***Multiplicative Distribution***: Each household receives the same percentage increase in its income. If group i receives total benefits B^i then a household in that group with income y_i would receive a benefit of $B^i y_i / n_i \mu_i = \delta_i y_i$ where μ_i is the mean income of group i and δ_i is the percentage by which each household's income increases. Benefits that come from increased subsidies to wages or from increased prices received by group members (for example, higher producer prices received by small farmers) would tend to change group income distribution in this multiplicative way.

For case (1), if the per household benefit to group i is Δ, the post-subsidy P_α measure for that group is

$$P_{i,\alpha} = \int_{\bar{y}}^{z-\Delta_i} \left[\frac{z-(y_i+\Delta_i)}{z}\right]^\alpha f_i(y_i)\, dy_i \tag{4}$$

Differentiating (4) with respect to Δ_i gives

$$\frac{\partial P_{i,\alpha}}{\partial \Delta_i} = \int_{\bar{y}}^{z-\Delta_i} \alpha \left[\frac{z-(y_i+\Delta_i)}{z}\right]^{\alpha-1} \left[-\frac{1}{z}\right] f_i(y_i)\, dy_i = -\frac{\alpha}{z} P_{i,\alpha-1} \tag{5}$$

Since

$$\Delta_i = \frac{B^i}{n_i}, \quad \frac{\partial \Delta_i}{\partial B^i} = \frac{1}{n_i} \tag{6}$$

then

$$\frac{\partial P_{i,\alpha}}{\partial B^i} = \frac{\partial P_{i,\alpha}}{\partial \Delta_i}\frac{\partial \Delta_i}{\partial B^i} = \frac{-\alpha}{n_i z} P_{i,\alpha-1} \tag{7}$$

What is important here is that an increase in the budget on poverty reduces poverty. The amount by which P_α changes when each income increases marginally is given by the number of units below the poverty line, which is proportional to $P_{\alpha-1}$. For example, if $\alpha=1$ then the Poverty Gap is proportional to the Headcount measure.

In the case where the benefits are multiplicative, increased funding also reduces poverty. The post expenditure P_α for that group becomes

$$P_{i,\alpha} = \int_{\bar{y}}^{\frac{z}{1+\delta_i}} \left[\frac{z-y_i(1+\delta_i)^\alpha}{z}\right] f(y_i)\, dy_i \tag{8}$$

Differentiating (8) with respect to δ_i gives

$$\frac{\partial P_{i,\alpha}}{\partial \delta_i} = \int_{\bar{y}}^{\frac{z}{1+\delta_i}} \alpha \left[\frac{z-y_i(1+\delta_i)}{z}\right]^{\alpha-1} -\frac{y_i}{z} f_i(y_i)\, dy_i \tag{9}$$

Now

$$\left(\frac{z-y_i(1+\delta_i)^{\alpha}}{z}\right) = \left(\frac{z-y_i(1+\delta_i)}{z}\right)^{\alpha-1} \left(\frac{z-y_i(1+\delta_i)}{z}\right)$$

$$= \left(\frac{z-y_i(1+\delta_i)}{z}\right)^{\alpha-1} \left(1-\frac{y_i(1+\delta_i)}{z}\right)$$

$$= \left(\frac{z-y_i(1+\delta_i)}{z}\right)^{\alpha} - \left(\frac{z-y_i(1+\delta_i)}{z}\right)^{\alpha-1}$$

$$\Rightarrow \left(\frac{z-y_i(1+\delta_i)}{z}\right)^{\alpha-1} \left(\frac{-y_i(1+\delta_i)}{z}\right) = \left(\frac{z-y_i(1+\delta)}{z}\right)^{\alpha-1}\left[\left(\frac{z-y_i(1+\delta_i)}{z}\right)-1\right]$$

$$= \left(\frac{z-y_i(1+\delta_i)}{z}\right)^{\alpha-1} - \left(\frac{z-y_i(1+\delta_i)}{z}\right)^{\alpha-1} \left(\frac{y_i(1+\delta_i)}{z}\right)$$

Now recall

$$\frac{\partial P_{i,\alpha}}{\partial \delta_i} = \int_{\bar{y}}^{\frac{z}{(1+\delta_i)}} -\frac{\alpha y_i}{z}\left[\frac{z-y_i(1+\delta_i)}{z}\right]^{\alpha-1} f_i(y_i)\,dy_i \qquad \textbf{(10)}$$

$$= \frac{-\alpha y_i}{z}\int_{\bar{y}}^{\frac{z}{1+\delta_i}} \left\{\left(\frac{z-y_i(1+\delta_i)}{z}\right)^{\alpha} - \left(\frac{z-y_i(1+\delta_i)}{z}\right)^{\alpha+1}\right\} f(y_i)dy_i$$

$$= \frac{-\alpha}{1+\delta_i}\left(P_{i,\alpha-1},\ -P_{i,\alpha}\right) \qquad \textbf{(11)}$$

Now

$$\delta_i = \frac{B^i}{n_i\mu_i} \quad so \quad \frac{\partial \delta_i}{\partial B^i} = \frac{1}{n_i\mu_i}$$

$$\Rightarrow \frac{\partial P_{i,\alpha}}{\partial B^i} = \frac{\partial P_{i,\alpha}}{\partial f_i}.\frac{\partial f_i}{\partial B^i} = -\frac{\alpha}{n_i\mu_i(1+B^i/n_i\mu_i)}\left(P_{i,\alpha-1} - P_{i,\alpha}\right) \qquad \textbf{(12)}$$

Again, a change in the CDB funding on poverty has a negative effect since $P_{i,\alpha-1} > P_{i,\alpha}$. Equation (12) suggests that if incomes in a group are increased by the same multiplicative factor, the change in P_α is proportional to the difference between P_α and $P_{\alpha-1}$.

It should be noted that the analysis discussed previously can be extended to several groups using the fact that the FGT poverty measure is additively decomposable into mutually exclusive groups (see Kanbur (1986)). This implies that if the data is available, one could examine what would happen to poverty in different regions, sectors and so on, for a given change in the CDB budget. Note also that this analysis can be extended to include socioeconomic interdependence (see Berrian and Thorbecke (1993)) but to implement this method would require micro data which at the present

moment is unavailable for Caribbean countries. In addition, the CDB do not directly distribute subsidies nor change factor prices, thus it is anticipated that the results of its' and other multilateral funding may be smaller than the above two types of distribution activities would suggest. The next section sets out a less data-hungry approach to test the assertion that funding has a negative impact on poverty.

6. The Empirical Model

There are several factors that are considered by scholars and practitioners to influence poverty. The unavailability of data does not allow us to consider several of these potentially important variables. For example, variables like quality of the housing stock or homelessness, productivity, unemployment and the environment had to be omitted because statistics measuring these variables are not compiled in most of the Caribbean countries. Moreover, data on variables which were found were only available for a short period of time. Thus, it is left to us to choose variables expected to be of major influence and where data are readily available. In this respect, the following factors merit attention, along with the CDB funding factor discussed above.

Economic Growth: The faster per capita incomes rise, ceteris paribus, the more quickly poverty will recede, though there is no strict correlation between the changes in incomes and an improvement in the distribution or with a reduction in numbers below the poverty line. Hence, economic growth is a necessary but not a sufficient condition for declining poverty (see Bhagwati (1988) and Bhatt (1988)). Cross-country statistical tests on a large scale do not uncover strong links running from GDP growth to the incidence of poverty, but individual country studies drawing on the experience of East and southeast Asian countries, project a much more persuasive case.

Population Growth: Rapid population growth is one of the most important factors which dilute the flow of the benefits of growth to the poor. At the simplest level, faster population growth obviously means a slower growth in per capita incomes for any given rate of growth of gross domestic product, and therefore a slower rate improvement in average living standards. High growth rates of population also add to the already severe pressure on agricultural land worsening the land - man ratio and promoting fragmentation and landlessness, all of which militate against the reduction in poverty.

Illiteracy: Education improves productivity and thereby increases income. The provisions of primary education to the rural population can directly contribute to the raising of living standards. In addition, education can promote growth in a more generalized fashion (see Denison (1967)). Enhancing training by enabling individuals to absorb fresh ideas and technology is one of the most important instruments, first in the effort to eradicate poverty and second in trying to achieve greater income equality. Aside from the gains in worker productivity, the deepening of managerial, engineering and scientific skills permits allocative and x-efficiencies that radically improve levels of corporate performance. It is becoming increasingly apparent that the competitive margins of Japanese manufacturers derive in significant part from the quality of the workforce (see Edsall (1988)). The East Asian experience also underlines the importance of education (Papanek(1988) and Scitovsky (1986)). Education also increases the bargaining skills of the least advantaged.

Fertility: High levels of fertility have a direct bearing on poverty: this association works in several ways. A high birth rate translates into high dependency rates, it also means short spacing between children and thus contributes to their poor mental and physical development. Repeated pregnancies translate into high rates of maternal mortality and morbidity; mothers in poor health are not able to provide the type of care children require and contribute to their poor development.

Inflation: Inflation affects the welfare of the poor through two channels. First, since inflation is a tax on money balances, and since the poor hold most of their assets in the form of currency rather than inflation-protected assets, inflation could have a disequalizing effect on the real value of wealth. Second, inflation can have an effect on the real wage. Of these two impacts, the wage effect is by far the most important (see Cardosa (1992) for an extended discussion). The reason is that money holdings of the poor are a small fraction of their income, not large enough to make the inflation tax a significant burden. Furthermore, when there is an acceleration of inflation to levels at which the tax might become important, there may be a speedup of wage payments, which reduces the need to hold cash balances.

The five factors identified plus lending by CDB gives the following model to be estimated:

$$POV = f(GDP, POP, LIT, FER, INF, CDBF) \quad (13)$$

POV is the index of poverty, measured here by the UNDP Human Development Index (HDI), the Basic Needs Index (BNI), the Integrated Poverty Index (IPI), and the Headcount Index (P_0). HDI is a very stern proxy for poverty but as was mentioned in the first section no other poverty series are available over a period of time for all the countries.[3] However, cross-section results based on twelve countries are presented for a subset of variables in equation (13) using all the indices. Note the impact of the explanatory variables on the HDI or the BNI will have the opposite effect to that on the Headcount index or the IPI, for example, economic growth is expected to be negatively related to P_0 and IPI but positively related to the HDI and BNI.

GDP is the change in purchasing power parity, real per capita gross domestic product. This variable plus the literacy rate variable (LIT) were taken from the UNDP Human Development Reports. All the other variables came from the CDB data files. The crude birth rate is employed as a proxy for fertility. Three measures of CDB funding were utilized: cumulative disbursement from the Special Development Fund (SDF), cumulative disbursement from the Official Capital Resources (OCR) and total funding disbursed (TDIS) which includes SDF, OCR, plus Other Special Funds disbursed (OSF). OSF was excluded from the econometric analysis because this form of funding was not used by many of the countries in this study, making econometric estimation difficult and inferences unreliable.

7. Empirical Results

As time series data are unavailable for a long enough period, two types of models are estimated, namely a cross - section regression model covering twelve Caribbean countries in 1993 and a pooled regression model employing the same countries over the period 1988 to 1993. For the latter, a fixed effect model is utilized as this model takes into consideration the possible structural and cultural differences of these economies by using different intercept terms in the pooled regression model .

[3] The use of HDI may imply a "circularity" problem since some of the explanatory variables in equation (13) are used to construct the HDI. To avoid this, other indicators of poverty would have to be employed. These, however, as mentioned earlier, were unavailable or only available for a limited period.

The results of these models are given in Tables 3 and 4. Table 3 uses cross-section data on the four measures of poverty while Table 4 utilises pooled data on the HDI. Each model depicts the results from the three different types of CDB funding, that is, SDF, OCR and TDIS. For cross - section and pooled models, like equation (13) or any variant thereof, rigorous specification checks are needed. That is, it is necessary to test the standard least squares assumptions since violation of these can lead to unreliable inference. For example, it is possible that variables like inflation and population growth feedback into poverty, resulting in simultaneous - biased regression coefficients and violating the exogenous assumption in the process. However, many of these diagnostic tests are difficult to compute for pooled regression models, so only a subset of these tests are discussed. It is assumed that the others are not violated.

For most of the models, the coefficient of multiple determination (R^2) is quite high, suggesting that most of the variation in the poverty indices is explained by the variation in the explanatory variables. The models also appear not to suffer from serial correlation, judging by the Durbin-Watson (DW) statistic, and since appending various autoregressive terms revealed that they were insignificant (results available on request).However, heteroscedasticity is present and is corrected using weighted least squares. Thus, the models appear to be good from a statistical point of view.

All the variables in the cross-section models are significant and have the *a priori* correct. The variables in the pooled regression model except population growth have the predicted signs and three are significant at the conventional level (GDP, BIRTH and CDBF). However, the size of all the variables appear quite small. Let us now consider the CDB funding variables in more detail.

The cross-section and pooled regression models reveal that CDBF is a significant regressor as judged by the significant value of the t statistic - mainly at the 10% level. Moreover, it has the correct sign: if CDB provides more funding to Caribbean countries, ceteris paribus, it reduces the Headcount Index and the Integrated Poverty Index and increases human development and the Basic Needs Index. However, the size of the coefficients in each case, except for the more narrow concept of poverty, P_0, suggests that investment would have to be heavy to achieve a sizeable reduction in poverty: to reduce P_0 (IPI) by one unit the CDB would have to invest between US$0.3 million (US$33 million) to US$5 million (US$70 million)while to increase HDI (BNI)

by one unit the CDB would have to invest between US$15 million (US$43 million) to US$33 million (US$58 million). The difference here lies in the fact that HDI, IPI and BNI are more comprehensive measures of poverty than P_0 and BNI and IPI come closer to measuring poverty than P_0 or HDI. The finding that a large amount of money is required to reduce poverty marginally is consistent with the so called elasticity argument which states that countries with a high development profile (low poverty levels) would need to invest a lot more money to increase development by one unit than countries who are relatively low in development (high poverty). It should also be noted, though not surprisingly, that the SDF has the largest impact on poverty - US$0.3 million or US$43 million is required to reduce poverty by one unit, depending on which poverty measure is assumed. This reflects the fact that the SDF is specifically designed for poverty-oriented projects.

8. Conclusions

The main focus of this study was to assess the direct impact that the CDB funding, through its special resource funds, had on poverty levels in the Caribbean. It was found that the CDB funding reduced poverty in the Caribbean but the direct effect has been very small. The study shows that for a one unit change in the poverty index, defined broadly, the CDB would have to invest between US$15 million to US$70 million, depending on which funding mechanism and poverty index were used. Not surprisingly the SDF has the largest impact on poverty in the Caribbean primarily because this resource fund is specifically designed for projects committed to the poor. The small effect of the CDB funding on the poor suggests that the CDB will have to inject a substantial amount of money into its member countries if it is to make a serious direct dent in the level and severity of the poor. In addition, the results suggest that more careful monitoring of the projects will be necessary in order to increase the efficiency of the investments. The results from this paper are also suggestive that IPI and BNI are better measures of poverty than HDI or P_0.

Besides funding from the CDB, this study indicates that policies aimed at increasing economic growth and/or reducing fertility could help in the eradication of poverty in the Caribbean. Education and inflation which are always taunted as important factors in poverty alleviation programs are not shown to be statistically relevant in this exercise.

The study also suggests that there is a need for the CDB to expend some resources to help in the collecting and collating of important poverty-related data in its member countries. Data on variables like productivity, unemployment and the environment would certainly have helped to improve the quality and credibility of this study.

Finally, for future agenda, it should be noted that it is possible that studies done on other development institutions like the World Bank could give different results to those reported here for the CDB. So, at the very minimum, what is require is a similar model specification with appropriate data.

Table 1: Welfare Measures in the Caribbean

Country	*Head Count Index (percentage poor)*	*Human Development Index*	*Integrated Poverty Index (severe poverty >0.40)*	*Basic Needs Index (very needy, <0.50)*
Antigua and Barbuda	12	0.796	0.223	0.892
Bahamas	5	0.854	-	-
Barbados	8	0.894	0.057	0.926
Belize	35	0.666	0.501	0.677
Dominica	33	0.749	0.501	0.782
Dominican Republic	21	0.638	0.380	0.699
Grenada	20	0.707	0.192	0.862
Guyana	43	0.580	0.591	0.773
Haiti	65	0.354	0.735	0.439
Jamaica	34	0.749	0.688	0.831
St. Kitts & Nevis	15	0.730	0.282	0.800
St. Lucia	25	0.709	0.355	0.773
St. Vincent & Grenadines	17	0.732	0.396	0.776
Suriname	47	0.677	0.356	0.818
Trinidad & Tobago	21	0.855	0.239	0.831
Caribbean average	27	0.710	0.394	0.777
Developing Countries average	-	0.541	0.467 (median)	0.600 (median)

-- Not available
Source: World Bank (1996)

Table 2: Human Development Index for Caribbean Countries

Country	*1987*	*1988*	*1989*	*1990*	*1991*	*1992*	*1993*
Antigua and Barbuda	0.898	0.832	0.781	0.785	0.796	0.840	0.866
Bahamas	0.880	0.920	0.875	0.785	0.854	0.894	0.895
Barbados	0.925	0.945	0.927	0.875	0.894	0.99	0.906
Belize	0.805	0.700	0.665	0.928	0.666	0.883	0.754
Dominica	0.906	0.800	0783	0.689	0.749	0.776	0.764
Dominican Republic	0.699	0.622	0.595	0.819	0.638	0.705	0.701
Grenada	0.849	0.751	0.758	0.586	0.707	0.786	0.729
Guyana	0.808	0.589	0.539	0.787	0.580	0.622	0.633
Haiti	0.356	0.296	0.276	0.541	0.354	0.362	0.359
Jamaica	0.824	0.761	0.722	0.275	0.749	0.721	0.702
St. Kitts & Nevis	0.801	0.719	0.686	0.736	0.730	0.873	0.858
St. Lucia	0.789	0.699	0.712	0.697	0.709	0.732	0.733
St. Vincent & Grenadines	0.775	0.636	0.693	0.720	0.732	0.761	0.738
Suriname	0.788	0.792	0.749	0.709	0.677	0.762	0.737
Trinidad & Tobago	0.885	0.876	0.876	0.751	0.855	0.872	0.872

Source: United Nations Development Program, Human Development Reports, 1990-1996.

Table 3: Results of Model Using Cross Section Data

	Constant	GDP	SDF	OCR	TDIS	R^2	DW
P_o	40.08 (6.63)	-0.003 (4.03)	-3.39E-06 (1.86)			0.64	2.04
P_o	34.57 (6.40)	-0.003 (-3.27)		-6.46 E-07 (1.74)		0.54	1.64
P_o	37.85 (6.44)	-0.003 (3.63)			-1.09 E-06 (1.81)	0.60	1.84
BNI	0.80 (22.91)	1.22 E-05 (2.29)	2.31 E-08 (1.99)			0.63	2.39
BNI	0.74 (23.21)	1.69 E-05 (2.94)		2.24 E-08 (1.70)		0.49	2.40
BNI	0.79 (20.13)	1.60 E-05 (2.65)			1.72 E-08 (1.92)	0.47	2.50
IPI	0.53 (15.33)	-5.11 E-05 (-3.37)	-3.01 E-08 (1.93)			0.62	2.38
IPI	0.51 (17.15)	-5.11 E-05 (3.98)		-2.42 E-08 (1.63)		0.68	2.54
IPI	0.50 (5.83)	-4.92 E-05 (-3.60)			-1.41 E-08 (1.85)	0.65	2.40
HDI	0.69 (14.04)	1.88 E-05 (2.51)	5.99 E-08 (1.82)			0.51	2.30
HDI	0.68 (17.15)	2.11 E-05 (3.06)		3.93 E-08 (1.82)		0.51	2.15
HDI	0.66 (14.70)	2.09 E-05 (2.89)			5.30 E-08 (1.62)	0.49	2.31

Note: t-statistics in parenthesis

Table 4: Results of Model Using Pooled Data

	HDI	HDI	HDI
BAH - Constant	0.90	0.80	0.84
BAR - Constant	0.87	0.81	0.82
BEL - Constant	0.82	0.55	0.78
DOM - Constant	0.81	0.77	0.79
GRE - Constant	0.82	0.79	0.78
GUY - Constant	0.23	-0.03	0.11
JAM - Constant	0.34	0.07	0.21
KN - Constant	0.80	0.76	0.76
L - Constant	0.78	0.73	0.74
VG - Constant	0.78	0.74	0.74
TT - Constant	0.67	0.51	0.58
GDP	1.78E-05 (2.96)	1.45E-05 (2.26)	1.78E-05 (3.01)
SDF	6.76E-08 (1.80)	-	-
OCR	-	3.73E-08 (2.07)	-
TDIS	-	-	3.04E-08 (2.27)
FER	-0.008 (2.48)	-0.006 (2.10)	-0.007 (2.31)
INF	-0.0005 (1.23)	-0.0005 (1.20)	-0.0004 (0.96)
LIT	0.001 (1.07)	0.001 (1.35)	0.001 (1.47)
POP	0.0002 (0.76)	0.0002 (1.00)	0.0002(0.87)
R^2	0.99	0.99	0.99

Note: t-statistics in parenthesis

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